

THE DEVELOPMENT OF COOPERATIVE ACTION
IN INFANTS

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ABSTRACT

Cooperation, the joint management of objects, actions or ideas to fulfil a purpose that two interactants share, is rarely studied. However some of the communication of infants in their first year with adults may involve cooperative action. Predictions about the origins and development of infant cooperation were derived from six theoretical approaches to early social behaviour.

Four observational conditions were devised to study mother-infant cooperation and to test the theoretical predictions. Five infant girls and their mothers were video-taped in each of these conditions when the infants were aged 34, 38, 42, 46, 50 and 54 weeks.

The communication of mothers and infants was analysed to define behaviour categories based on the intention of the actions determined by their interpersonal functions. Examination of the behaviour categories indicated that the subjects' cooperation consisted of directives, gestures to direct the partner's action, and their compliant responses. For four infants compliance with mothers' directives for actions on objects appeared during the course of the study and for all infants these actions became more frequent with age. In addition three infants gave directives to their mothers. These changes in infant behaviour were not conditioned by the mothers or induced by the mothers' interpretation of fortuitously performed infant actions, nor were they the result of infants imitating the mothers. Modifications in the mothers' behaviour and the increased frequency with age of infant communicative actions to direct the mothers' attention to objects indicate that cooperation is part of a general development in the infants' understanding of human action to which the mothers adapted as proposed by the theory of infant intersubjectivity. Support for this position comes from the subjects' person play which showed similar changes to those in communication with objects.

Results indicate that the infants did not need the mothers to structure their use of the new communicative actions. Further, by their looks at the mother's face and positive affect the infants marked these actions to direct the mother's attention and action as being of interpersonal significance. The mothers' reports about their daughters' behaviour at home indicate that during the period of study the infants performed more cooperative actions as they grew older and became more perceptive of other persons' actions, attentions and emotions.

It is proposed that the onset and growth of infant cooperative action denotes an endogenous development in understanding of personal agency, both the infant's own and that of other persons. The infant can use this understanding to learn about his world by observing other persons' actions, by inducing them to act in specified ways and by joining in cooperative action with them.

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CHAPTER ONE: DEFINITION OF HUMAN COOPERATION AND EVIDENCE FOR
COOPERATION DURING INFANCY

1.1 DEFINITION OF HUMAN COOPERATION

In their everyday life humans, of necessity, cooperate. Cooperation is fundamental to the management of all human institutions, be they national or international ones concerned with legal, political and fiscal procedures, or on the local community or domestic scale of the home, workplace, school and neighbourhood organisations. It is apparent in every kind of interaction, including simple practical projects like moving furniture or wallpapering, as well as in shared use of abstractions like making a deal on the stock exchange or completing a programme of academic research.

In this thesis evidence will be presented that infants under one year are able to engage in joint actions that meet the basic requirements for cooperation in direct engagement. When considering the origins in childhood of such a potentially complex human activity as cooperation, it is necessary to define the basic processes in their simplest and most general form. Throughout this thesis the term "cooperation" will be used to mean the joint management of objects, actions or ideas to fulfil a purpose that two interactants share. This is similar to the definition used by Nelson and Madsen (1968) who, in their study of children, considered that cooperation occurred when individuals coordinated their actions to achieve a shared goal or purpose. The

definition implies that there are certain minimum requirements for cooperation.

A. A shared plan of action has to be established within mutual orientation. This may be by prior agreement to meet or communicate at a distance for a specific purpose. Cooperation may also arise spontaneously in interactions when a person conveys an idea by word or gesture and indicates to another how they may collaborate.

B. Each participant has to make a distinct contribution that actively promotes the shared plan. For this the cooperators must know each other's possible contributions to a joint enterprise. This involves interpretation of the participants' motives, actions and communications relative to each other. That is each has to distinguish clearly between his own and other people's actions and perspectives and integrate them into a single coordinated event or procedure.

C. Cooperation is willingly entered into and negotiated. It should be distinguished from persuasion and coercion which involve differing degrees of antagonism, force and resistance. In the extreme case one individual acts entirely at the will of another. This behaviour is not cooperative. On the other hand, willing obedience to conventional authority is essential to the complex social cooperation of societal institutions and contributes to their effectiveness. This requirement for cooperation is similar to a criterion set by Harré (1982) in defining actions as intentional and purposive human expressions. He suggested that actions are not

forced or the result of compulsion. The effect of such pressure would be what Harré terms "non-actions".

1.2 STUDIES OF HUMAN COOPERATION

In spite of its prevalence and inherent complexity, cooperation between people has not been an important area of study in psychology where research has concentrated on the individual and his solitary reactions. However a number of studies has looked at the relative importance of cooperation and competition in the behaviour of children from the perspective of conventions in social morality. Several studies indicate that cooperation in the positive sense of "helpfulness" shows developmental changes and it has been found that such cooperation is highest in the preschool years and that it gradually decreases as the child progresses through school where competition is encouraged (Parton, 1933; Madsen, 1971 and Friedrich and Stein, 1973). Cross-cultural differences in tendencies to cooperate and compete have been found with Mexican children cooperating more than Anglo-American ones (Madsen and Shapira, 1970 and Kagan and Madsen, 1971), and conditioning studies have established it is possible to influence the amount of cooperation used by a child in a game for a prize (Azrin and Lindsley, 1956; Nelson and Madsen, 1968 and Vogler et al, 1970). There have been very few studies of spontaneous cooperation occurring in the everyday behaviour of children. Notable exceptions are the work of Parton (1933) and Friedrich and Stein (1973). Yet this approach offers a vast area

for research into such aspects as the development of cooperative behaviour, the personality characteristics of children who cooperate best and the actions used to initiate and maintain interaction for cooperative purposes.

On a quite different line there have been developments in psycholinguistic theory in recent years that are pertinent to the study of cooperation and communication in general. Speech act theory (Austin, 1962 and Searle, 1969) proposes that utterances have not only a propositional or truth-stating content, but also an interpersonal force. This analysis recognises that in speaking, people try to affect each other in particular ways, warning, informing, commanding, seeking information, thanking, promising, etc. As a consequence of this advance in theory of language function, a large part of psycholinguistic research has moved from studies of the grammar and structure of utterances or text to studies of language including conversational speech used to exert interpersonal influence.

Grice (1975) gave important clarification of the interpersonal functions of language by suggesting that conversations are essentially cooperative events and that "each participant recognises in them, to some extent, a common purpose or set of purposes, or at least a mutually accepted direction" (p.45). The contributions of the participants are mutually dependant and to use Grice's own term "dovetailed", and agreement is explicitly reached about when a conversation should start and end. In developing his ideas about the "cooperative principle" in conversations, Grice sought evidence about

what people try to achieve together in using language and he used the practical examples of people jointly mending a car or mixing a cake.

Grice's ideas have received support from studies of the joint regulation of conversations. Sacks et al (1974) proposed that in naturally occurring conversations, their openings, closing, the turn-taking of the participants and changes in conversational topic are all "interactionally managed" by the participants. Each of the parties to a conversation has a goal or purpose and is also aware that others too are seeking to achieve purposes in the conversation. While conversing all the participants are involved in careful planning to allow each person to reach his goal.

Such theories about the communicative nature of language have supported an increasing interest in description of adult interpersonal behaviour in the recent past. There have been many detailed studies of non-verbal communication, interpersonal perception and training in social skills (Hinde, 1972; Argyle, 1967 and 1975; Argyle et al, 1981; Danzinger, 1976 and Weitz, 1979), as well as more informal studies of the structure of sequences of human social behaviour (Goffman, 1956 and 1971, and Morris, 1977), while the ethnomethodologists' studies of everyday interactions have sought to elucidate practical social knowledge and reasoning (Garfinkel, 1967; Cicourel, 1974 and Mehan and Wood, 1975). The studies have been very wide ranging and though most have not explicitly investigated cooperation, many of the techniques developed would be appropriate to such a programme.

1.3 EVIDENCE FOR COOPERATION DURING INFANCY

The growing interest in interpersonal behaviour and communication has also been expressed in studies of infants. This has created a revolution in thinking about early human psychology. No longer is the infant seen as helpless and psychologically isolated from other people. Even young infants have been found to be unexpectedly precocious in engagements with persons. Evidence has been gathered about the forms, phasing and patterning of interpersonal attention, emotional expression, gesturing and vocalisation of infants in the first few months interacting with their mothers, e.g. Jaffe et al (1973), Brazleton et al (1974), Trevarthen (1974 and 1979), Stern (1974a, 1974b and 1977), Stern et al (1975) and Bateson (1975).

It was this kind of finding that led Trevarthen and Hubley (1978) to investigate interpersonal behaviour throughout the first year of life and in the course of this they found evidence for infant cooperation. Initially there were two separate studies of infants aged under six months. One looked at the infant's interaction with the mother and the second was an investigation of early reaching and manipulation of objects. In order to find out how these two areas of psychological action developed, one mother was invited to come to the laboratory with her daughter (Tracey) for video-recording at regular intervals from three weeks after the infant's birth until her first birthday. These recording sessions were unconstrained and from the free play between mother and infant it became apparent that social and object related activities did not remain separate after

four or five months. The mother used her daughter's interest in objects to stimulate her attention, creating games of animation and teasing. When the baby was ten months old there was a dramatic change in their interactions. For the first time in the observation sessions mother and infant performed joint activities like proffering and receiving toys, giving gestured directives for actions on toys and actively complying with these. The mother and infant clearly found delight in the new communicative abilities to engage in joint practical activities which Trevarthen and Hubley identified as cooperation.

Other researchers have found changes in communication at this age. While not studying cooperation, many of the communicative actions they describe appear to be cooperative. In his scales of infant development, Illingworth (1980) proposed that at forty weeks the infant is expected to pull another person's clothes to attract attention and four weeks later he should hold out an arm or foot to help with dressing and drop objects so that they will be picked up. At one year the infant may kiss a person on request. Other developmental assessment scales (e.g. Griffiths, 1954 and Buhler and Hetzer, 1935) suggest the examiner use instructions to get the infant to perform particular test items. However the behaviours being assessed are manipulatory and not interpersonal or communicative, e.g. hitting two objects together.

Using speech act theory to analyse the transition from prelinguistic communication to language, Bruner (1975, 1977) suggested that

linguistic concepts are first expressed in action. By studying the joint action of mother and infant, Bruner identified actions of shared reference and exchanging communicative roles in giving and receiving objects which are the kinds of communicative actions used in cooperation. Bates and her colleagues (1975 and 1976) employing ideas from speech act theory and Peirce's (1932) pragmatic analysis of language, made a study of prelanguage communication. They described a number of gestured communications that appeared in different subjects in a consistent order. These gestures included the cooperative ones of inducing the adult to perform particular actions.

Sugarman-Bell (1978) found evidence of communication about objects starting towards the end of the first year. She identified person oriented and object oriented actions which in young infants were performed separately. At nine or ten months they started combining these areas of action to give coordinated person-object orientations. Among the examples of person-object orientations Sugarman-Bell gives are giving or taking objects on request.

Halliday (1975) in a study of the earliest manifestations of actions of meaning in his son's vocalisations, argued that learning to talk involves a process of interaction between the child and other people and that the linguistic system the child is acquiring has a functionally organised semantic system as well as a phonological system. From an early age language is used to regulate the actions of other people and this was apparent in his son's protolanguage, i.e.

there was a consistent use of particular vocalisations in different situations. Halliday identified four functions to achieve specific communicative effects in the protolanguage of this infant between nine and twelve months which he glossed as demands for objects, commands for events to be repeated, greetings and personal expressions of interest, pleasure and withdrawal.

There would appear to be much evidence that by the end of the first year infants have started to communicate with other people about the use of objects, regulating their attention and actions accordingly. While these investigations have not set out to study infant cooperation, they provide evidence of early gestural and vocal behaviours that indicate cooperative understanding.

1.4 AIMS AND SUMMARY OF THIS THESIS

This study sets out to further investigate early infant cooperation, to identify its forms and precursors and to try to account for its origins. Chapter Two describes the theories contending to explain early development of social and interpersonal understanding and predictions are derived from these about the origins of infant cooperation. Chapter Three gives details of the practical procedures and theoretical basis of the analysis used to investigate the communications of mothers and infants, while in Chapter Four is presented a discussion of the categories of communication identified in this study in order to establish which may be cooperative.

Then Chapter Five gives evidence about infant cooperation and its onset relevant to the contending explanations for its origin.

In the study of Tracey in which Trevarthen and Hubley (1978) first discovered infant cooperation, they also identified a "period of games" prior to the appearance of cooperation. However, they did not examine the social play of the subjects once they had been identified as cooperating using objects. Chapter Six sets out to describe the developments in social play in the second half of the first year and to clarify the relations between communication using objects and actions in social play. Particular attention is paid in Chapter Seven to the infants' attempts to engage the mother in communication in order to establish the contributions of infants and mothers to creating and maintaining cooperation and other forms of communication. Psychological research indicates that interpersonal expressions of gaze, smiles and laughter are important in maintaining communication and in Chapter Eight the infants' use of the behaviours are examined to establish how they function in cooperation and other communication. Chapter Nine presents evidence from the mothers' reports of the infants' use of cooperation in their everyday home life. Finally in Chapter Ten, the findings are discussed and implications drawn about the nature of early human cooperation and its importance for subsequent acquisition of skill and knowledge.

CHAPTER TWO: PSYCHOLOGICAL THEORIES OF INFANT SOCIAL AND
INTERPERSONAL UNDERSTANDING AND ITS DEVELOPMENT

The communication shown by infants in their first year already involves complex interpersonal behaviours. Although cooperation itself has not been extensively studied, psychologists have developed theories about infant social behaviour which can help to explain cooperation. There are six main theoretical approaches dealing with the origins and development of infant social behaviour and knowledge. These derive from cognitive development, learning theory, modelling, symbolic interactionism, attachment theory and the theory of innate infant intersubjectivity. Each of these will be considered in turn.

2.1 COGNITIVE DEVELOPMENT

Piaget's psychological theory of human intellectual development describes an active child who, by his actions and cognitions, tries to make sense of the surrounding world (1953). The child is not simply at the mercy of external events. According to Piaget there is an interaction between the individual and his environment through adaptation involving the twin processes of assimilation (the individual organising the world by his actions and mental processing) and accommodation (the modification of the individual's actions and cognitions by the structure of the environment). Through this process of adaptation Piaget suggested that the individual develops concepts

about the world. These gradually become more sophisticated and abstract and the individual passes through a sequence of stages, each characterised by particular modes of conceptual functioning. The motivation for this growth is intellectual, i.e. the process of refining and elaborating the individual's mental schemas for representing the world.

One of the main problems that Piaget's theory poses for social development is the assertion that a young child is innately unable to see things from another person's point of view, i.e. the child has an egocentric understanding of the world. Then as he grows older his egocentric thought is replaced by more mature socialised thought. In his initial egocentric state, the child does not even know himself to be separate from his environment. As his understanding of the world becomes less egocentric, the child is able to separate himself from the world, but is still not able to examine his concepts from the point of view of other people. Piaget (1928) considered that social interaction with his peers, not experience with physical objects, was critical in causing the shift from egocentric to socialised thought.

According to Piaget, children are egocentric until they reach middle childhood and he suggested this is apparent in their communication skills, moral judgement and in judging perspective and some studies of children's social understanding have supported Piaget (e.g. Flavell et al, 1968; Selman, 1971; Hollos and Cowan, 1973). This position has been challenged by other researchers who have criticised

Piaget's experimental tasks for setting constraints that create difficulties or confusion for children. Giving modified tasks they have found that children show a more mature understanding of other people's motives and perspectives than they do on the standard Piagetian tasks (e.g. Shatz and Gelman, 1973; Chandler et al, 1973; Hughes, 1975). Evidence from studies of young infants also challenge Piaget's ideas about their egocentrism. Infants in the first three months interact with their mothers by showing emotional expression, and by mutual regulation of attention and action (Stern, 1977 and Trevarthen, 1974 and 1979), with expectations of the mother's action (Murray, 1980) and imitation of face and hand gestures (Maratos, 1973 and Meltzoff and Moore, 1977).

Some psychologists have uncritically adopted Piaget's views on infant egocentrism in applying his theory of cognitive development to the infant's interpersonal and emotional understandings. For example, Cowan wrote that before four months infants

"react responsively to persons as interesting social objects but there is as yet no truly social interaction" (1978, p.90)

He also considered changes in interpersonal behaviour to be the result of changes in the infants' social cognition that match their cognition about physical objects. Cowan explained observations of attachment behaviour around eight months of age as being the result of infants having developed the concept of a permanent social object. Youniss (1978) also considered the infant's achievement of the concept of permanence to be important. For him it is the point at which other persons begin to play a direct role in the infant's

attempts to order his social world. However, neither Cowan nor Youniss investigated these issues and studies that have been done of the infant's reactions to strangers and his conceptions of object permanence (Brossard, 1974) and causality (Goulet, 1974) show no clear relationship between interpersonal behaviour and cognition about objects.

The strength of Piaget's work has lain in his description of children's thinking. However, recently even this has been challenged. Some research indicates that in tackling the tasks Piaget set, children misunderstood the experimenter's meaning or intentions. When the tasks were modified to eliminate ambiguities arising out of the experimenter's language or action, the children performed better than on the standard task (e.g. McGarrigle and Donaldson, 1974 and Bryant, 1974). Other researchers have found that a child's success in some of Piaget's tests depends on whether the way objects are used in the test matches the way these objects are used in the everyday life of the child (Freeman et al, 1980 and Lloyd et al, 1981). So it appears that not only must the idea of childhood egocentrism be reassessed, but also the child's cognitions about the physical world. When trying to determine a child's cognitive abilities it is no longer possible to ignore either the communication between adult and child or the child's knowledge of the conventional uses of objects.

Schaffer (1971, 1977) adopted a cognitive developmental approach to the social development of infants. Drawing on Piaget he suggested that the infant is active in organising his experience and

psychological growth occurs not by environmental moulding or by maturation of the infant, but as a result of the interactions between the infant and his world. Schaffer (1977) noted that there is a major change in communicative ability at the end of the first year. He suggested that this requires the development of certain cognitive mechanisms which he identified as the differentiation of means from ends, the differentiation of self from other, the growth of both object permanence and of representational skills. He added that in order to allow the infant to deal with social events in terms of a remembered past and anticipated future, an expansion in memory capabilities is required. Also needed is a growth in attention span to allow the infant to relate to two objects at the same time as in playing ball with the mother.

It has been suggested that the earliest social interactions of infants with their mother are evidence of some form of differentiation of self from other (Lewis and Brooks, 1975). However, Schaffer's identification of this distinction in the communicative developments at the end of the first year is important as the infant's communicative behaviour indicates that they may have new conceptions of self and of other as being able to create effects to influence each other. Schaffer did not give a reason to explain why he considers the concept of a permanent object necessary to the development of communication. However object permanence is an example of the growth in representational skill which does seem to be relevant to the development of cooperation and related communicative abilities.

Kagan (1979) like Schaffer identified memory as being important in the development of new competences at the end of the first year. He used memory to explain the anxiety and distress shown by infants at this age when their mothers leave them. However in both types of behaviour, distress at the mother's departure and increase in communicative ability, improvement in memory capacity or recall ability alone cannot explain the change in behaviour.

For both these behaviours explanation has to be sought in the significance of the events for the infant. The infant may recall or predict events. However, it is the value given to these events by the infant that gives rise to his reaction and any change in behaviour would not be as the result of changes in memory processing, but in changes in the perception or understanding of the events. A similar argument can be made about Schaffer's ideas on the need for a growth in attention span. A change in attention abilities cannot create a new type of behaviour without the relevant change in understanding.

Of particular importance for Schaffer's explanation of the change in infant communication at the end of the first year is the infant's mastery of Piaget's sensorimotor stage V allowing him to differentiate ends from means. Here Schaffer is suggesting that advances in communicative ability are the results of improved understanding of causality in the physical world. Initially Bates and her colleagues (1975 and 1976) independently gave the same explanation to account for early attempts by infants to get others to do things. However

further research has led Bates and her co-workers to change their position (1977). The closeness in age at which infants perform equivalent interpersonal and object related tasks led them to suggest that

"it is more likely that cognitive and communicative events . . . are based on some shared underlying structure" (1977, pp.297-8)

Similarly, Sugarman-Bell (1978) suggested that the two domains of communication and physical cognition are largely separate, though may be mediated in part by common underlying schemas.

Piaget's work has been seminal in highlighting the interaction between the child and his world in cognitive growth and it created a vast new area for psychological research. However, challenges to his theory only serve to show how much more there is to understand about children's intellectual and social development and the relationship between them. The results of studies of cognitive development make certain implications for the investigation of infant cooperation. First, the evidence indicates that during the first year the infant is not wholly egocentric but shows surprising interpersonal skills. Second, it appears that explanations for social behaviour including cooperation should be in terms of interpersonal understanding and not in terms of cognitive constructs used to explain infant action in the physical world.

2.2 LEARNING THEORY

For many psychologists, ideas about the nature of human infants and

their psychological growth have been dominated by J. B. Watson. He believed that all forms of social behaviour like emulation, imitation, rivalry, pugnacity, anger, resentment, sympathy and parental love, result from people and events conditioning the individual. He wrote that behaviours are

"built in by the parent and by the environment which the parent allows the child to grow up in. There are no instincts. We build in at an early age everything that is later to appear." (1928, p.23, Watson's italics)

He postulated that there are some unconditioned stimuli that evoke innate responses of fear, rage and love and so provide the foundations on which all further social responses are conditioned. This theory was an attack on the arcane symbolism of Freudian psycho-analysis and Watson believed it could account for the complexity of human social and interpersonal life. He suggested that

"the same object can become a substitute stimulus for a fear response in one situation and a little later a substitute stimulus for a love response in another, or even for a rage response. The increasing complexity brought about by these factors soon gives us an emotional organisation sufficiently complicated to satisfy even the novelist or poet." (1925, pp.73-4)

Skinner's (1938, 1953, 1957 and 1974) theory of operant conditioning provided an important paradigm for learning theorists. This approach focussed on the animal's or person's spontaneous actions or operants and the effect of subsequent reinforcement in changing or shaping the behaviour. Some reinforcers like food and water have intrinsic reinforcing values and are termed primary reinforcers. Other reinforcers are acquired by a process of generalisation and are called secondary reinforcers. Social reinforcements, e.g. personal

attention, approval, affection and submission, are generalised reinforcements because they have gained their reinforcing value by the fact that other people have mediated in providing a subject's primary reinforcement. For example, the mother's presence and attention becomes socially reinforcing as a consequence of her providing food to the infant and so these can be effective in reinforcing other behaviours not concerned with feeding like learning prohibitions. According to Skinner, a person's spontaneous or self-initiated action is shaped or changed by its reinforcement consequences and so his initiatives in the physical and social world are controlled by his environment.

Skinner emphasised the importance of observing behaviour in scientific attempts to predict how people and animals will respond in different situations. He was trenchantly opposed to explanations of behaviour based on introspection or on unscientific concepts such as free will and psychic phenomena, arguing that only observable events could be used to explain why a person or animal behaved in a particular way. This extreme position led him to exclude from his theory scientific evidence on the physiology and neurology of human behaviour on the grounds that these mechanisms are not directly observable in intact subjects functioning normally and their effect could only be inferred. This rejection of internal explanations extended to ones based on cognitive processes and evidence of developmental changes in childhood. So while Skinner suggested that Watson was extreme in the claims he made about training infants and admits that genetic factors influence behaviour, his theory

deals only with environmental influences on behavioural change. His theory does not differentiate between different kinds of human action as the principles of conditioning are the same in meeting physiologically based needs, e.g. thirst and hunger, and in forming cultural activities like aesthetic or intellectual pursuits.

Gewirtz (1969, 1971 and 1972) whose theoretical position has been described as one of "radical behaviorism" (Aronfreed, 1972), has used Skinner's operant paradigm to study the social behaviour of children and infants. He believed that the stimulus-response functions of dyadic interactions are pervasive and highly organised and that this fact has led to the development of diverse theories to account for social behaviour. Gewirtz argued that while the position he proposes does not preclude other theoretical approaches, a theory of operant conditioning deals parsimoniously and efficiently with both simple and complex behaviours.

While laboratory studies have shown infants capable of rapid conditioning (e.g. Siqueland and Lipsitt, 1966 and Koch, 1968), it has been argued by Bruner (1978) that no study has convincingly demonstrated that such procedures can account for developments in social behaviour. It may even be necessary to reinterpret the results of laboratory conditioning studies as changes in behaviour that result from other mechanisms than passive reaction to reinforcement. Observation of three week old infants in an operant conditioning situation led Papousek (1969) to suggest that the infants were trying to solve the problem set by the situation and they did this

for its own sake rather than for the reward of food. In other words their motivation was cognitive.

Many learning theorists have been influenced by Piaget and in opposition to Skinner they have incorporated cognitive and developmental factors into explanations for changes in social behaviour. They have changed their ideas about children and even modified learning theory itself to allow the child some degree of control over socialising forces. Sears (1972) raised the issue of the "meaning" of the external reinforcers for the child and Cheyne (1972) discussed the child's internal representation of an event changing its effectiveness as a reinforcer. According to learning theory, such internal representations of external events could be the result of previous conditioning. However, some learning theorists allow that these internal representations may reflect psychological growth and change not solely attributable to contingencies of external influence. For example, Cairns (1977) wrote that

"continuity and change have more substantial roots
than only prior learning and cognitive experiences"
(p.20)

and he went on to consider the effects of "developmental pacemakers".

Lewis and his colleagues have studied several aspects of infant social behaviour and they emphasised the importance of social reinforcement, though their work has also been influenced to some extent by Piaget. They consider the infant to be actively seeking stimulation and using information from the world as a function of his individual plans, personality and cognitive organisation (Lewis

and Brooks, 1975). However, Lewis and Brooks argue that Piaget's position can be considered preformationist as the progression of cognitive structures are taken by him to be invariant across cultures. While Lewis and Brooks conceded that cognitive structures for logico-mathematical knowledge may be invariant, they suggest that there is little evidence for invariance in the structures for social knowledge. They cited person permanence as studied by Bell (1970) and Décarie (1965) as the only examples of such invariance during infancy.

In a study of prelinguistic conversations, Freedle and Lewis (1977) concluded that language evolution and ontogenetic language acquisition both arise through social interaction. As a result of evolution they considered there is some "weak prewiring" that provides a basis for the development of language. However, evolutionary endowment is overshadowed by social reinforcement which

"may be the most effective behaviour shaping
mechanism in infancy" (Lewis and Brooks, 1975,
p.119)

Lewis and Brooks-Gunn (1979) suggested that development arises through the individual's interactions with the world. This provides the information which the infant uses to understand the world and is also the process by which his motives for action are created.

So it appears that while some learning theorists admit that infants are actively involved in trying to understand the world rather than being passive subjects of conditioning, their main emphasis is on the influence of social reinforcement in developing human behaviour

and motives. Any cooperation an infant shows in performing actions with other people according to this approach would be the result of conditioning by adults. The infant may be actively organising his experiences, but his behaviour and possibly also his motives for cooperation are powerfully structured by the adults' use of reinforcements to shape his actions.

2.3 MODELLING

An important and distinct aspect of social learning theory is a process variously named as observational, imitative or vicarious learning or modelling (Bandura, 1969 and 1977). It is suggested that

"all learning phenomena resulting from direct experiences can occur on a vicarious basis through observation of other persons' behavior and its consequences for them." (Bandura, 1969, p.118)

In this type of learning it is necessary to distinguish between response acquisition and performance as a person may acquire a response solely by watching another person without having made any attempt to perform it himself.

When discussing social learning theory, Bandura doubted that the procedure of reinforcement shaping a response could be adequate to explain most learning in everyday situations. He argued that people are faced with many potentially dangerous situations, e.g. traffic, expanses of water, fire, etc. and reliance on trial and error and

successive approximations would involve the child in intolerable risks. Further, he pointed out that without observational learning many responses would never occur spontaneously and so would not be available for reinforcement. Bandura also differs from psychologists who hold to extreme positions in social learning theory by accepting that developmental factors, that is changes in the intrinsic constraints of the child, affect his abilities to model behaviours. This approach is also taken by Hartup and Coates (1972) who were interested in the interaction between stimulus inputs and developmental status in observational learning.

Commenting on the criticism that modelling would produce mere mimicry of the modelled behaviour, Bandura referred to studies which show that this is not an automatic process but involves subjects responding

"to new stimulus situations in a manner consistent with the models' dispositions" (Bandura, 1969, p.149)

This position is supported by Gewirtz and Stingle (1968) when they suggested that generalised imitation provides a basis for the psychoanalytic concept of identification. They proposed that this consists of imitating the psychological characteristics of a model, e.g. his motives, attitudes, values, roles or affective states rather than particular behaviour patterns.

Bandura (1969) suggested that there are four major functions that influence the nature and degree of this type of learning. The subject has to attend to the modelled behaviour and his attention is

regulated by factors like the perceived status of the model, his similarity to the observer and the effectiveness of his action. Next, the subject has to retain a memory of this behaviour using a mechanism such as visual imagery or verbal encoding. The subject then has to develop a motor reproduction process, i.e. he must have an organised mental representation of how to proceed in performing the modelled action. This is described by Lavinge and Burns (1981) as

"an active organization-integration process through which novel responses can be created and not merely copied" (p.33)

The final influence on this type of learning is the incentive-motivational process which indicates that a person is more likely to perform acts which have reinforcement value.

The cognitive mechanisms of attention, retention and motor representation that Bandura proposed are insufficient to explain the complex interpersonal processes involved in observational learning by infants. Parton (1976) considered that Bandura failed to explain how an infant acquires a new matching response in the first place. He pointed out that Bandura did not discuss the mechanisms by which the infant may "link up" the observed modelled behaviour with appropriate matching response. Modelling by infants (and by children and adults too) would require that the subjects have some concept of the similarities in body and action of self and other. They would also require some mechanisms that can identify and distinguish attitudes, affective states, motives, values, etc. of another person and then reproduce them in the infant's own action.

In observational learning a person requires experience of observing desired behaviour performed by other people and questions arise about the consistency of modelled behaviour and the clarity of the models to be followed. This, and the suggestion that reinforcement for imitation need not be external but may be internal, i.e. self-induced or self-regulated (Bandura, 1969 and Aronfreed, 1969), indicates that in observational learning much choice or discretion on the part of the learner is required. Nonetheless observational learning theory would consider infant communicative behaviour, including cooperation, to be acquired by imitation of other people's modelled behaviour. While the constraints set by the infants' developments in imitation is acknowledged, the explanation in terms of modelling does not specify the range of interpersonal psychological processes involved.

2.4 SYMBOLIC INTERACTIONISM

George Herbert Mead's (1934) ideas have been important in pointing to the influence of other people and society on the individual's mind and thinking. He proposed that

"mind can never find expression and could never have come into existence at all except in terms of a social environment" (p.223)

He rejected the suggestion that there is any biological contribution to the development of mind, claiming that his view

"enables us to give a detailed account and actually explain the genesis and development of mind" (p.224)

He believed that biology could not account for the discontinuity between the instinctively controlled societies of species like bees and ants and the social process of human society.

For Mead subjectivity is not present at birth, but arises from the individual's social experiences. Communication in the form of significant symbols, i.e. language, provides a type of behaviour in which the individual becomes an object to himself. This is achieved when a person uses language and in so doing causes the same response in himself as he does in another person. As mind and thought are socially constructed, Mead believed that

"there neither can be nor could have been any mind or thought without language and the early stages of the development of language must have been prior to the development of mind or thought" (p.192)

Mead did not account for early communication or language, and he appears to have under-estimated the psychological processes they involve. Communication of all forms requires persons to be both active and reactive and capable in some way of distinguishing self from other and participants must have some degree of subjectivity. Also, as Ryan (1974) pointed out, language acquisition itself involves a process of socialisation.

Mead's theory has influenced recent investigators of infant development, e.g. Lock (1980) who studied "the guided reinvention of language" that takes place in each child's experience. Lock sees the infant at birth as having

"criteria for constituting entities as both physical objects . . . and biological objects" (p.27)

These he terms individual objects as no other person is involved in the acquisition of this knowledge. However, according to Lock, the infant has no innate criteria to organise knowledge of social objects and he has to rely on his mother to do this for him because she knows their meanings. He describes the process by which the child comes to gain knowledge of social objects as follows.

Initially the infant experiences changing bodily states which induce him to make non-significant gestures. The mother perceives these gestures as having particular purposes or meanings and by her action makes them effective as actions. Acting on her perceptions, the mother creates values and goals for the infant's actions and so leads the infant to enrich the perception of his own actions. This then changes the way he is able to employ his actions, allowing him eventually to form goals for himself.

It is not clear from Lock's account whether the infant is active in exploring social relations and meanings, or whether he is passive apart from action connected with a change in bodily state. Lock does not explain the motives that cause the infant to change the perception of his own actions and subsequently to create his own goals. Further it is not specified how closely the mother's interpretations need to match the infant's bodily states or whether they may be quite arbitrary in relation to them.

There are also problems with the observations which Lock (1978) claims support his theory that the mother's actions create intentions for the infant. He traced the development over five months

of the use of arm-raising by one infant to indicate that he wanted to be picked up. Lock suggested that the regularity of the mother's action each time she picked up the infant allowed her seven and eight month old to anticipate when she was going to pick him up and so he lifted his arms in advance, as an expression of anticipation. Then at nine months the infant made a "wrong guess" about the mother's action and this had a "very important consequence" as the mother responded to his arm-raising gesture by picking him up when she had not intended to do so. According to Lock, the child had stumbled upon the ability to create an intention for the mother. However, in Lock's account, after incorrectly anticipating the mother's action, the infant turned away from her and moved rapidly across the room. It was not until then that the mother responded to his arm-raising and picked him up. So it is not clear whether the infant had understood the link between his mother's action and his own and the importance of this event is in doubt. In Lock's next observation, he considered that the infant was using arm-raising to make a request to be picked up. However, this was a whole month after the previous observation and Lock offers no further evidence of this infant gesture having been formed by the mother's interpretation of the infant's action. The process of the development of communicative understanding remains obscure and a matter of speculation.

Other psychologists studying pre-language communication have taken a similar position to Lock. Clark (1978) considers

"a child's earliest utterances to be indeterminate in intent until made determinate by the interpretations placed upon them by adults" (p.233)

Similarly, McShane (1980) writes that

"by consistently responding to an infant's behaviour as if it was intentional behaviour the adult effectively makes a self-fulfilling prophecy" (p.8)

He suggests that an infant learns the contingencies between his own behaviour and the responses of adults and eventually uses this knowledge to produce the adult response.

Thus, symbolic interactionism would suggest that the motives and behaviours for cooperation arise out of interpretations put on the infant's acts by other people. The infant is seen as unintentional until he starts using his behaviours according to the interpretation placed on them by other people. This implies that he should not be able to initiate completely new cooperative acts, but because he cannot plan or predict, he is only able to perform acts which have previously been interpreted to be cooperative.

2.5 ATTACHMENT THEORY

In 1951 the psychoanalyst, Bowlby, prepared a monograph for the World Health Organisation about the emotional experiences of early infancy and later antisocial behaviour and psychiatric problems. He suggested that it was essential for later mental health for people to have experienced a warm, continuous relationship with the mother during infancy and early childhood. Later (1958, 1969) he developed a theory of attachment to try to account for his findings. Adopting an ethological approach, he identified five proximity seeking

attachment behaviours in infants (crying, following, clinging, smiling and sucking) which he suggested have the survival value of protecting the infant from predators. The child directs these behaviours to the person who cares for him and so he develops an affectional bond with that person. Bowlby's theory has been criticised on both theoretical and empirical grounds (see Rutter 1972 for a summary), but his work has been important in stimulating interest in the emotional and interpersonal life of infants.

Bowlby's work suggested that the infant is active in creating and maintaining relations with his caretakers. Ainsworth et al (1974) influenced by Bowlby, concluded that the infant does not need to be taught to be social. They maintained that the infant's effectiveness in gaining proximity to his mother indicates that he is social from the outset. Stayton et al (1971) found that infants aged nine to twelve months showed

"a simple disposition to comply with maternal commands and prohibitions" (p.1057)

They claimed that this infant obedience was not the result of training or discipline and they suggest this indicates that the infants are adapted to be socialised and are active in their own socialisation.

An attachment theory explanation of infant social behaviour suggests that infants are biologically adapted to become involved in and learn through interaction with other people. Their social behaviour and motives are inherent and do not depend only on social reinforcement or the interpretation of adults. However, care must be taken

as Bowlby's theory is based on hypothesised behaviour of early man and concentrates on the emotional aspects of relationships. It does not deal with the communicative functions involved in cooperative action in the physical world.

2.6 INTERSUBJECTIVITY

Trevarthen (1979) proposed that infants are innately subjective and intersubjective. By using the term "subjectivity" he is suggesting that in their earliest actions infants show rudiments of individual consciousness and intentionality. Intersubjectivity refers to the infant's ability to relate to another person in a manner that recognises his own and the other person's subjectivity and so engage in interactions with joint intentionality and control.

Trevarthen has taken the concept of intersubjectivity from Habermas (1970) who used it in analysing language and argued that certain aspects of language have particular intersubjective functions, e.g. personal pronouns enable an "interlacing of perspectives". This allows a person to keep separate his own and another person's viewpoints and so understand the meaning of events for both of them. Habermas stated that articles, demonstrative pronouns and expressions specifying time and space

"link the levels of intersubjectivity on which
the subjects converse" (p.141)

He also suggested that performatory speech acts have intersubjective functions or intentions. Trevarthen considers intersubjectivity to

be active not only in adult language, but also in the very earliest human development. As well as distinguishing between people and physical objects, he argued that infants show a clear preference for human care and understanding before going through a period of curiosity and exploration of physical objects.

Trevarthen (1980) proposes that underlying perception and action there are motives which he defines as a set of structured states that are internal causes of behaviour. These specify both the action and the expected result of that action. Motives are not the result of experience. They are present in at least some form at birth and come to be modified by experience. Some motives are those underlying subjectivity, i.e. for dealing with objects, and others underly intersubjectivity, i.e. for interacting with other people. Motives are internal dispositions to act and perceive in particular ways and cannot be observed directly. However, the infant's motives become expressed in observable intentional action and so it is possible to infer the structure of infant subjective and intersubjective motives.

Trevarthen suggests that infants have "a powerful set of rudimentary mental operations" that guide the first acquisitions of knowledge about the world. For him, psychological development involves a process in which the infant's own actions provide feedback that causes elaboration in the infant's mind and so produces new actions. According to this epigenetic theory the developing infant evokes particular forms of stimulation from both the physical and personal

world and this stimulation is then used to create new structures of mind. This is somewhat similar to the process described by Piaget (1953) in the development of schemas. However, there is a profound difference between the positions of Piaget and Trevarthen. Piaget's theory of egocentrism considers the infant to be isolated from the influence of other persons and gaining knowledge through his own efforts only. Trevarthen's theory of intersubjectivity allows the infant to acquire knowledge from the action of other people as well as from his own action. He believes that changes in interpersonal knowledge and action are the result of a brain adapted to respond to and evoke human cultural processes. The earliest preference for human interaction may imply that motives for dealing with people and objects not only co-exist, but that those for dealing with people may be fundamental in the infant's learning of the uses of objects.

Trevarthen's theory would predict that early cooperation arises out of changes in the innate intersubjective motives of the infant. These motives are influenced by experience, but also allow the infant to leap ahead of experience and try to express novel meanings. This theory suggests that early cooperation is the result of infants both responding to appropriate adult behaviour and being able to elicit appropriate behaviour from adults.

Newson (1977a) states that he is in broad agreement with Trevarthen's position on infant intersubjectivity in that he considers the human infant to be innately primed or pretuned to enable him to communicate with others. Newson and Newson (1975), discussing early social

behaviour, point out that the infant plays an active and directing role from the start and the interaction is never under the sole control of either partner. They write that

"whatever communication takes place emerges as an intersubjective product of their joint collaboration" (p.442)

This, so Newson and Newson suggest, draws attention to the principle that

"human cognitive understanding arises from a process of negotiation between two or more human beings" (p.442)

However, Newson's (1977b) description of early mother-infant interaction emphasises a limited aspect of intersubjective behaviour. He considers the intrinsic periodicity of infant and adult action to be fundamental to early interactions which are based on, and consist of, rhythmic interlocking of the infant's attentional abilities with the adult's behaviour. Also, he includes ideas from symbolic interactionism about the role of other people in interpreting the infant's action. Newson points out that the mother does not respond to all the infant's actions but only those she judges to be coherent and relevant in human terms as intentions or communications. He suggests that

"it is only because the mother imputes meaning to behaviours elicited from infants that these eventually do come to constitute meaningful actions as far as the child himself is concerned"

Newson, borrowing and modifying an image used by Bruner, suggests that the mothers tend to perform a "scaffolding function" by which intentions are imputed or attributed as a stage towards their subsequent acquisition by the infant.

So it appears that Newson's ideas about infant intersubjectivity are different from Trevarthen's and in certain important respects resemble the social construction theory of symbolic interactionism and his theory would predict that infant cooperation arises out of the interpretations and structuring of communication by the mother.

2.7 THEORIES OF INTERPERSONAL DEVELOPMENT AND THE STUDY OF COOPERATION

In this thesis evidence on infant cooperation will be examined in an attempt to establish which theory best accounts for the growth of infant cooperation. The communication of mothers and infants will be analysed and compared with the predictions made by social learning theory, modelling, symbolic interactionism and the theory of infant intersubjectivity.

Consideration of the cognitive developmental approach indicates that it is inadequate as an explanation of infant cooperation for two reasons. First, it is necessary to reassess the concept of infant egocentrism and second, changes in infant social behaviour cannot be explained in terms of the infant's understanding of the physical world. The development of cooperation necessarily involves changes in cognition about persons and their actions, and relevant theory and evidence from cognitive development will be reassessed in the light of findings from this study.

CHAPTER THREE: OBSERVATIONAL PROCEDURES, SUBJECTS AND THE THEORY
OF DEFINING CATEGORIES OF BEHAVIOUR FOR ANALYSIS

3.1 PROCEDURES FOR STUDYING MOTHER-INFANT INTERACTION

It is occasionally possible to find a naturally occurring situation to study mother-child behaviour. Anderson (1972) for example, sat in a park and watched young children leaving and returning to their mothers. But distant observation is not appropriate for investigating the details of mothers' and infants' behaviour in face-to-face situations, or in studying the way they regulate each other's behaviour and share knowledge and interest about the world. The small and rapid movements of expression require that the observation be carried out at close range and a certain amount of intrusion into the lives of the subjects is unavoidable.

In studying communication of infants or young children with their mothers, data have been collected in a variety of ways. Some researchers used television or film either in the laboratory (e.g. Murphy and Messer, 1977; Pawlby, 1977; Schaffer et al, 1977; Trevarthen, 1977) or in the home (e.g. Jones, 1977; Kaye, 1979). Whereas others have made their records directly with the aid of check lists or by written accounts (e.g. Ainsworth, Bell and Stayton, 1974; Lewis and Wilson, 1972; Dunn and Richards, 1977). Yet other researchers have combined television and written records (Whiten, 1977; Fraiberg, 1979).

At the start of this study of early cooperative behaviour, video-tapes of one infant, Tracey, and her mother, made in the laboratory, were studied and a set of behaviour category descriptions was defined. Then repeated visits were made to the homes of four infants, two boys and two girls aged between six months and one year, to observe them playing with their mothers, being fed and dressed and playing on their own as well as playing with the researcher. Notes on the visits were made as soon as possible after leaving the homes. On a few of these home visits, attempts were made to make notes on the behaviour of mother and infant as they interacted using the categories developed in analysis of the video-tapes. These attempts to classify and record behaviour as it happened were not successful. It was important to have information on the behaviour of both infant and mother, but it was not possible to watch both carefully at the same time to identify categories of behaviour and record them. Often it was difficult to determine from the live behaviour the precise order of actions. For example, uncertainty arose concerning such events as who followed whose gaze, who smiled first, and whether the infant's giving was spontaneous or in response to the mother's request. On one occasion video-recording equipment was taken into the home. The infant found the camera fascinating despite attempts by the observer and mother to distract attention from it. Furthermore, on playing back the video-tape, it was apparent that if the infant were given freedom to move around on the floor, it would not be possible to have unambiguous information about the activities and interests of both infant and mother. Frequently they were too far apart for both to be 'on camera' and as

the infant moved about, his face was often hidden from the camera's view. These limitations on observing in the home led to the decision to confine the observations to the laboratory studio using video-tape recordings.

It has been argued that the laboratory is a very different environment from the home and consequently subjects perform differently in the two situations (Bronfenbrenner, 1979). In studies of mother-infant interaction in the laboratory, the mother usually has only the infant to attend to. However in everyday behaviour at home she is usually doing other things as well as interacting with the infant. In consequence, home interactions are likely to be shorter and less frequent than those studied in a laboratory.

There is evidence that mothers interact more and try more frequently to teach new words and skills to their children when they know they are being observed than when they believe they are not being observed (Graves and Glick, 1978). It appears that mothers perform in a manner that they consider shows good mothering, giving high levels of interaction.

In this study, the aim was to find out whether infants cooperated and if so, how they did it. As infant cooperation has only recently been documented in the psychological literature (Trevvarthen and Hubley, 1978, and Hubley and Trevvarthen, 1979) it may be assumed that it is a relatively rare, though significant, behaviour. In this case the artificial atmosphere of the psychological laboratory may help to elicit infant cooperation, because mother and infant are in close, face-to-face interaction most of

the time and are each likely to perceive and respond to many of the other's communications.

3.2 SUBJECTS

The subjects were five first-born infants and their mothers¹. It was decided to avoid any questions concerning sex related differences in the infants or in the ways the mothers treated them by choosing only girls. First-borns were selected because it was felt desirable to recruit mothers who were likely to be naive about any changes that might occur in the infants' behaviour during the period of study. The subjects were chosen from a group contacted through Health Visitors who were asked for normally developing, first-born, six-month-olds whose mothers would be willing to take part in the study. Prospective subjects were informed that participation would entail seven visits to the Psychology Department at the University of Edinburgh over a six month period for video-recording. In addition, there would be three visits to the home by the researcher, the first to acquaint the mothers with the procedures of the study, and two for detailed interviews about the infants' behaviour at home. All the families were home owners living in Edinburgh and biographical details are given in Table 3.1.

The mothers were informed that the aim of the study was to collect detailed material on the way the infants played with their mothers. By not stating explicitly the principal research interest in cooperation and communication, it was hoped to avoid inciting the

¹ See Appendix E.

TABLE 3.1 BIOGRAPHICAL DETAILS OF SUBJECTS

Infant	Age of Mother	Age of Father	Mother's Education	Mother's Employment Before Birth of Baby	Mother's Employment at Time of Study	Father's Education	Father's Employment	Mother's Place of Birth and Childhood Home	Father's Place of Birth and Childhood Home
ALISON	23	24	Diploma in Music	Student	Tutoring in Wind Instrument	Degree in Music	Maker of Musical Instruments	Surrey England	Surrey England
ANN	28	32	Post-graduate Diploma in Statistics	Statistician	Part-time Statistician	Professional Accountancy Qualification	Accountant	South Africa	South Africa
ELIZA	29	32	School to age 15 Hairdressing Apprenticeship	Hairdresser	Part-time Hairdresser	School to age 15	Administers Family Business	Edinburgh Scotland	Argyllshire Scotland
LARAGH	31	34	Physiotherapy Diploma	Hospital Physiotherapist	-	Law Degree, Professional Examinations	Solicitor with Family Business	Cork, Eire	Edinburgh Scotland
VANESSA	24	24	Degree in Nursing Studies	Hospital Nurse	-	Law Degree, Professional Examinations	Local Authority Solicitor	Aberdeenshire Scotland	Edinburgh Scotland

mothers to make efforts to train their daughters to provide what they thought the researcher wanted. Interest was ostensibly focused on the infants so that the mothers might feel less self-conscious before the television camera.

3.3 OBSERVATIONAL CONDITIONS AND INSTRUCTIONS TO SUBJECTS

In order to study spontaneous communication and to elucidate what this indicates about the infants' cooperative abilities, the following observation conditions were devised favouring a range of communicative and cooperative behaviours:

1. Mother and infant play with a toy. This condition was included to study the way that infant and mother joined in manipulating a toy and to establish the contributions each made to the joint action. The toy was a large plastic rattle that could be dismantled by unscrewing a clear globe from the blue handle to release a yellow ball the size of a table tennis ball. This toy encouraged the mother to become involved because, in order for the infant to explore it fully, the mother had to take it apart and reassemble it. The infants were incapable of performing these operations on their own. The mothers were instructed, "Play with (infant's name) using this toy in any way that she enjoys". While this was said, the researcher unscrewed and then reassembled the rattle, thus demonstrating what could be done with the toy.

2. Mother teaches infant. This was a deliberate attempt to provoke directing behaviour from the mothers to permit study of the infants' responses in order to establish whether the mothers systematically trained their infants. A wooden truck with a tray at the back to take three wooden dolls coloured red, green and yellow was presented to the mother who was told, "Teach (infant's name) to put the little men into the truck".

3. Mother and infant play without toys. This was included to permit observation of the way the mothers and infants interacted when no toys were provided and to establish the contributions each made to playful communication. The mothers were instructed, "Play with (infant's name) in any way that she enjoys".

4. Mother socially restrained. In this condition the mothers were asked to keep still and quiet, though close and responsive, in order to study the attention and communication the infants spontaneously directed towards them. The rattle, the truck and the three wooden dolls were placed on the table for the infants to play with, and the mothers were instructed, "(Infant's name) is going to play on her own. If she is friendly to you, be friendly in return. If she drops a toy pick it up again, but don't get involved in any games".

3.4 CONDITIONS FOR VIDEO-RECORDING

Mothers and infants were video-recorded in a carpeted room with the

exterior windows covered by blinds. Studio lighting permitted high quality video-recordings from an adjacent darkened room through a plain glass window partially concealed by a blind (Figure 3.1).

The infant was in a specially designed seat that allows maximum freedom of movement, held safely in place by a wide elastic belly band. A triangular felt covered table (sides 76 cm) with a semi-circle cut out on one side to fit the infant's body was placed in front of the infant, and the height of the infant seat was adjusted to bring the infant's waist level with the table top. The mother sat close to the table at the infant's left. To the infant's right was a front silvered mirror which gave a reflected image of the mother to the video camera.

There were two colourful posters on the wall and a selection of toys on a cupboard visible to both infant and mother. The mother was supplied with a box of paper tissues. The subjects were alone during recording while the researcher controlled the recording equipment in the adjacent room while observing through the window.

In every recording session the behaviour of the subject pairs was recorded for four minutes in each of the four conditions. Numerals showing the date and time to hundredths of a second were added to the video record by an electronic timer. After recording each condition the researcher entered the room and talked to the mother and infant for approximately thirty seconds before giving the instruction for the next condition and putting on the table the toys if these were required. The researcher then went back to the camera,

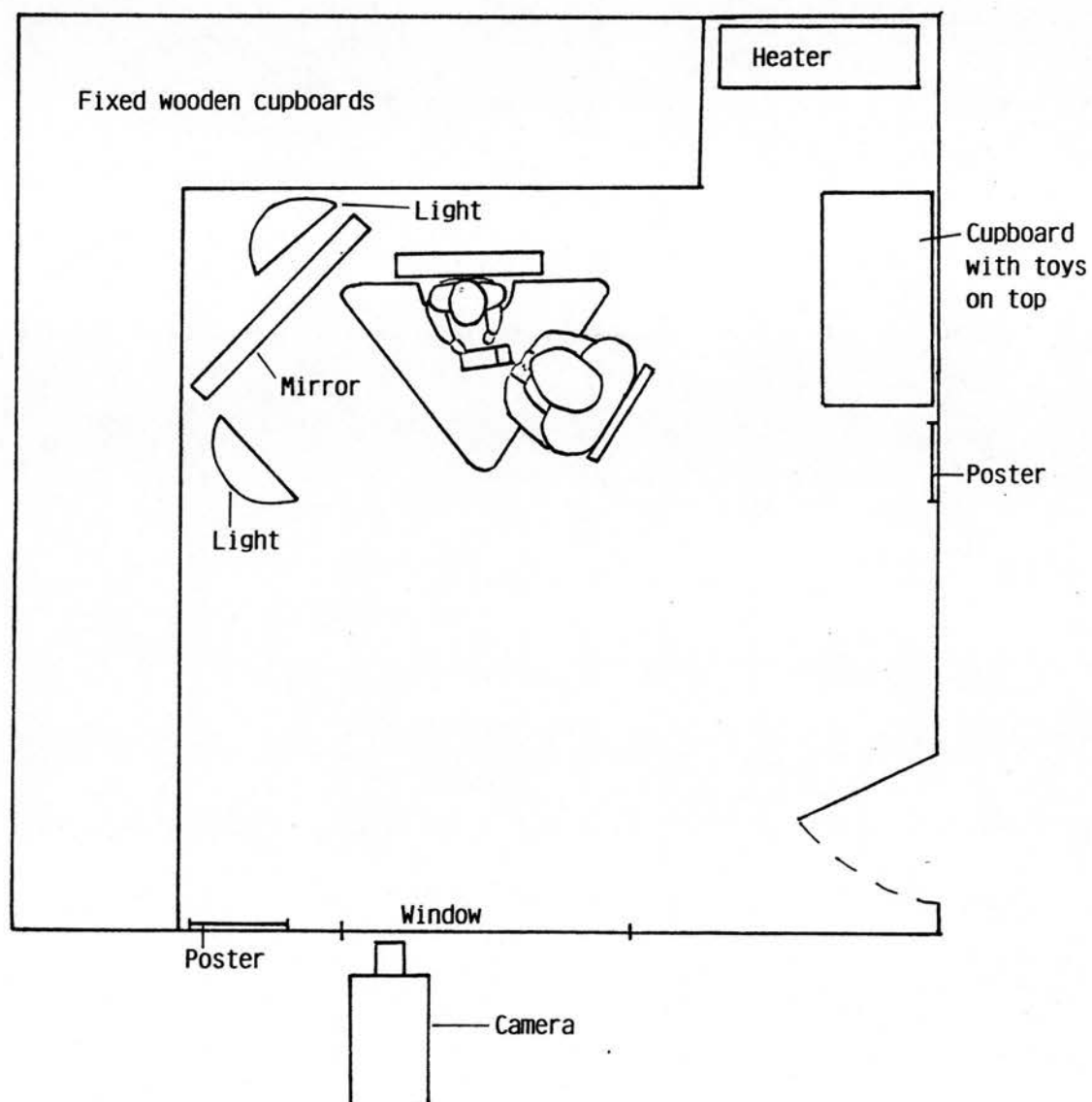


Figure 3.1 Plan view of recording room

checked the picture obtained and started recording. Occasionally the mothers moved their chairs or changed their positions and this was compensated for without interrupting the subjects or recording by adjusting the zoom lens. The image was as close as possible to the mother and infant to obtain a clear view of their faces and of their hands as they manipulated the toys. Only one researcher, the writer, was involved in making the recordings, though at times the mothers and infants met other members of the Psychology Department.

The mothers were invited to attend for seven recording sessions in each of which the observational conditions were varied to counter possible effects of fatigue or the influence of preceding conditions (Table 3.2). The first recording session scheduled when the infants were thirty weeks old was introductory to acquaint the subjects with the procedures and clear up any problems with equipment and procedures. This session was not analysed. Laragh and her mother were not able to attend the introductory session. However they quickly settled down in the first recording session and their behaviour was not noticeably different from that of the other subject pairs. Subjects were offered transport to and from the laboratory by taxi.

It was planned to record the mothers and infants at four-weekly intervals when the infants were aged thirty to fifty four weeks. However, holidays, sickness, family commitments and technical problems with recording equipment meant it was not always possible for recordings to be made at the designated time (Table 3.3). Twenty

TABLE 3.2 ORDER OF CONDITIONS FOR EACH SUBJECT PAIR AT EACH RECORDING SESSION

Infant	VIDEO-RECORDING SESSION NUMBER						
	1 (intro- ductory)	2	3	4	5	6	7
Alison	1 3 4 2	2 1 4 3	3 2 1 4	1 2 3 4	2 3 1 4	1 2 3 4	2 1 3 4
Ann	2 1 3 4	3 1 4 2	2 4 1 3	1 4 3 2	4 1 2 3	1 3 4 2	2 3 4 1
Eliza	4 3 1 2	1 3 2 4	3 2 4 1	2 3 4 1	1 4 3 2	2 4 3 1	4 3 2 1
Laragh	-	4 2 3 1	4 1 2 3	1 2 4 3	3 1 2 4	2 4 1 3	3 1 2 4
Vanessa	3 4 2 1	1 3 2 4	2 4 1 3	4 2 1 3	2 4 3 1	3 4 1 2	1 2 4 3

- 1 - Mother and infant play with a toy
- 2 - Mother teaches infant
- 3 - Mother and infant play without toys
- 4 - Mother socially restrained

TABLE 3.3 AGE OF INFANTS WHEN VIDEO-RECORDED

	VIDEO-RECORDING SESSION NUMBER						
	1 (intro- ductory)	2	3	4	5	6	7
SCHEDULED AGE OF INFANTS IN WEEKS	30	34	38	42	46	50	54
ACTUAL AGE OF INFANTS IN WEEKS							
Alison	30	36	38	42	46	50	54
Ann	30	34	38	42	46	50	54
Eliza	30	34	38	42	47	51	55
Laragh	-	34	37	40	44	49	54
Vanessa	30	34	38	42	46	50	54
MEAN AGE OF INFANTS IN WEEKS	30.0	34.4	37.8	41.6	45.8	50.0	54.2

two of the thirty recording sessions analysed took place on schedule. Five were a week early or late and three were two weeks from the planned date.

3.5 THEORETICAL BASIS OF ANALYSIS

In an attempt to avoid contentious issues about the intentions and intersubjective functions of communication in infancy, the initial analyses of the behaviour of mothers and infants were concerned only with the form and the focus of the behaviour. These analyses took as their model the transitional analysis employed by Jaffe et al (1973) to study the gaze patterns of mothers and infants aged three-and-a-half months. In order to try to find regularities in the engagements, the temporal patterning of gaze between mothers and infants was determined, identifying when each looked at the partner, at her own activity, at that of her partner, or elsewhere. Another analysis involved finding the transitional probabilities of the occasions when each subject began or terminated manipulation of the same object, while yet another looked at the effect of the mother handling a toy on the infant's subsequent behaviour. Did the infant look at the toy, manipulate it or apparently ignore what the mother had been doing?

This approach produced confusing numerical data and revealed no consistent or interpretable pattern. Although these analyses were based on careful measurement of the attentional and action patterns used to establish shared interest, they could not take account of

the diversity of communicative effects being achieved by the mothers and infants together. They clouded important distinctions in the behaviour, e.g. "mother starts manipulating object A" followed by "infant stops manipulating object A" might refer to the mother taking an object from the infant who was engaged in a solitary activity, or she might have been receiving an object offered by the infant, or the transfer may have followed a request by the mother for the infant to give the object. In other words, the analysis ignored the evidence that mother and infant were directing behaviour to each other intelligently and also adapting their behaviour in response to the partner. The communicative content was lost.

The initial approach taken in analysing the behaviour of the mothers and infants was inadequate for other reasons. It separated different modalities or modes of orienting or acting such as gaze, expressive movements of body and face, touching and object handling, and it did not consider the way these behaviours occurred in combination, fully integrated with each other. In addition it was at the level of "behaviour" defined by Harré (1982) as,

"a phenomenon in the physical world, related by physical chains of causality through a physiological system as far as it may be traced" (p.11)

Harré pointed out that in understanding humans it is not useful to employ only physical criteria as people perform "actions". As he wrote,

"events produced by human beings can also be embedded in a network of relations which depend upon an actor's intentions in producing the actions" (p.11)

He also distinguished "acts" which are

"embedded in a larger-scale system of the social
and practical world which human beings inhabit"
(p.11)

and depend for their effect on their socially mediated consequences.

Harré suggested that "the act" is

"the intersection between what is intended by an
actor and the interpretation given to his actions
by the interactor" (p.15)

In considering the social abilities of infants it is clear that their contributions to social exchanges do not employ conventional social acts as used by adults. It still remains to be determined whether any of their social expressions may be considered to be "acts" in Harré's terms as intentions to induce particular effects in people that are perceived as such by them.

Infants may not perform acts as Harré defined them, however the complexity and variety of the communications that were observed in this study led to the conclusion that these actions must be described in terms of their functions in communication. To do this rudimentary intentions to communicate had to be inferred. Recent studies of infant communication have stirred a lively controversy concerning the intentions which may be inferred at this age.

Some attempt to identify when an infant becomes intentional has been made by both Bates et al (1975) and by Schaffer (1977).

Discussing the communicative change at the end of the first year,

both suggested that on attaining Piaget's sensorimotor stage 5, the infant becomes capable of differentiating ends from means and therefore may be said to be beginning to act intentionally. Bretherton and Bates (1979) continued this argument, but their attempt to define the beginning of intentional communication is somewhat inconsistent. They defined intentional communication to be

"signalling behaviour in which the sender is aware a priori of the effect that a signal will have on his listener, persisting in that behaviour until the effect is obtained or failure clearly indicated" (pp.87-88)

They assert that this definition applies to the communicative behaviour of infants at one year but not before. However it can be argued that infants as young as two to three months, when they adapt their behaviour to the mothers and show expectations of their mothers' responsiveness to their expressive behaviour (Murray, 1980; Tronick et al, 1978; Tronick, 1979) are indicating that they have some recognition of the effect of their behaviour on the recipient. Infants have been found to persist in their attempts to engage the mother and when she fails to respond, express failure by turning away or showing distress (Murray, 1980). So the criteria set by Bretherton and Bates for identifying intentional communication are met by infants they consider to be too young to be intentional.

In seeking to show that infants become intentional at the end of the first year, Bretherton and Bates write that

"to influence a partner intentionally is not the same as communicating intentionally" (p.84).

However, they do not explain what they believe to be the difference

between these two forms of intentionality. They also suggest that "showing off" which they describe as the infant engaging "in a behaviour that has previously attracted the attention of an adult" (p.89) is not intentional communication. This seems an odd qualification as "showing off" is done in order to engage, attract or please the adult and so would appear to be an intentional form of communication by their previous definition.

It appears that Bretherton and Bates and also Schaffer are seeking to set arbitrary and confusing boundaries, suggesting that the more complex infant communication is intentional, while the apparently simpler is not. It may be more useful to consider the position of the philosopher Brentano (1973) who stated that all psychological action is necessarily intentional. Actions of perception, learning, cognition, emotion and communication are all intentional as they have reference or are directed to objects or events outside the person. Shotter and Newson (1982) take a similar position, suggesting that

"all human action is intentional in the sense that it is 'directed'; it 'points to' or 'contains something' other than itself; in short it means or is a means to something" (p.38)

Likewise, MacKay (1972) proposed a general conception of intentions. He referred to the Latin root "intendere" and suggested that intentional action is that which is aimed or directed in some way to events in the world. Infants in the first two months of life show evidence of perception (Bower, 1966, 1972; Day and MacKenzie, 1973; Eimas, 1974; Fantz, 1961), learning (Bruner, 1968; Fantz,

1964; Papousek, 1969; Siqueland and Lipsitt, 1966), emotion and communication (Murray, 1980; Tronick et al, 1978), and thus in Brentano's sense they are acting intentionally many months earlier than Schaffer or Bretherton and Bates were suggesting. Adopting Brentano's position on the intentionality of psychological action, there is no need to account for a fundamental change in the infant's nature from that of a non-intentional or pre-intentional being to that of an intentional one, though it is necessary to describe and account for changes in complexity and specificity of intentional function and expression.

The above argument does not imply that infants are consciously aware and carefully planning the communicative effects they achieve. The study of the role of consciousness in human intentional action is complex and difficult both theoretically and empirically. Nevertheless, it is apparent that even adults are not always fully conscious in the control of their actions. It is evident that a considerable proportion of human action may be performed at rather low levels of consciousness, sometimes using some kind of psychological "automatic pilot" (Berger, 1979). Harré's (1982) discussion of conscious monitoring of action suggests that consciousness becomes active when there is uncertainty or confusion about the goal or a difficulty is experienced in applying the means to achieve the goal. Such ideas may provide useful bases for investigations into the development of conscious awareness in intentional action. However this thesis is not addressing this issue and has no need to assume that infants are consciously aware in the way that adults can be, even when their

communicative actions indicate that they are reacting efficiently to the mother's communications.

3.6 DEFINING DESCRIPTIVE CATEGORIES OF COMMUNICATIVE ACTION

As little was known at the start of this project about the full range of behaviours in infant-mother cooperation, it was considered necessary to develop and refine descriptive categories from the communication itself, rather than be confined to a study of a priori categories of behaviour based on previous reports, like pointing, showing and giving already known to be used by infants in the second six months of the first year. Communicative actions of both mothers and infants were defined as actions by one partner evidently directed to the interests or actions of the other. In categorising communicative actions, it was necessary to identify their communicative or signalling functions. Here the term "function" is being used in the way proposed by Halliday (1975) in his analysis of the protolanguage of a child aged nine to eighteen months. He suggested that in its developmental origins, linguistic "function" was synonymous with "use". The function of a communicative action was therefore taken to be the use it served in the joint action between mother and infant. The function of each communicative action was determined by its form, by its relation to the action and attention of both communicators (context), and by the effect it produced in the partner. The form of an action is important because different communicative functions are often expressed in different



ways, e.g. the gestures for giving and pointing involve distinct movements. However, form alone is not sufficient as actions of similar form may have different communication values, e.g. when holding out a toy a person may be offering it in response to a request, spontaneously attempting to give or attempting to attract the partner's attention to it before performing another action with it. So the communicative context is important in defining the function of an action.

In many cases, the response of the partner gives confirmation of a communicative function, because the use or function of the action is the effect it produces in the partner. However, the partner's response could not always be used to help decide on a communicative function because on some occasions the partner ignored or obviously misinterpreted the other's communicative action. On the few times that this occurred, the function of the action was taken to be that given in previous instances in which the researcher judged that the same form of action had elicited an appropriate reply from the partner. Most types of communicative action occurred many times and when a rare type of action occurred the form of the action and context were carefully scrutinised to establish how it should be categorised. At all times the response to a communicative initiative was taken to be the partner's action which followed on immediately. No intervening change of action or attention by either partner was admitted. Thus problems attending the identification of delayed or deferred responses were eliminated.

Throughout most of the sessions the mothers talked about what they

were doing or wanted to do, or what they thought their infants were doing. It was possible to ascertain from the mothers' speech how they were using or reacting to particular actions. For example, while tapping or pointing inside the truck in the teaching condition, the mothers often said, "Put it in there", or "This is where it goes". Whenever a mother spoke while she performed this kind of action, her remarks expressed a request that the infant should put the doll into the truck. Therefore whenever a mother tapped or pointed into the truck, whether she spoke or not, it was understood that she wanted the infant to place the doll in the truck.

Determining the functions of the infants' actions, of course, had to be carried out without explanations from the infants. However, using several cues including mother's concurrent speech, infant's gaze, persistence and repetition of actions as well as their form, context and the responses they evoked, it was possible to develop mutually exclusive categories of infant communication.

Three main classes of communicative actions were found (Appendix A). One was made up of actions and orientations to objects, termed "communicative actions about objects". Another class comprised accentuated actions of the body in playful display and contact, termed "person play". The third class consisted of actions of "personal attention and emotional expression" which were used in combination with actions from the first two classes or on their own in interpersonal contact. Actions of this kind make up much of the communication seen in infants of two to three months of age (e.g. Trevarthen, 1974 and 1979 and Stern, 1977). This class includes looking at the

partner's face, leaning or reaching towards the other, expressions of comfort and affection as well as emotional expressions, such as smiling, laughing, distress and disgust. The relation between the communicative actions defined in this study and those identified by other researchers is given in Appendix B.

An important point in the development of the analysis was an attempt to investigate giving and taking objects in the interactions of mothers and infants. Transferring objects between the subjects occurred in several different ways indicating distinct psychological functions which had similar features to other communications not concerned with giving and taking. One way of transferring an object between the partners involved the mother holding out her hand, palm up, requesting the infant to place an object there. This gestured communication was similar to other communicative actions by which the mothers indicated how the infants should act, e.g. "indicates a locus". Such communicative actions aimed at directing the partner's activity were termed "directives". Infants too gave directives for the mother to take a toy, holding it out to the mother and waiting until she took it. This was distinct from another type of giving by the infants in which they thrust the object into the mother's hand or mouth. While the mother might have to make an adjustment, opening the hand or mouth to receive the toy, the infant did not wait for her to do so. Such infant giving was not a directive for the mother's action, but was similar to other communications in which the infant acted on objects in a manner that attracted the mother's attention, e.g. "performs object display", "touches with object" and "indicates object".

Another way of transferring an object between the partners was for one of them to take an object from the other without it being offered, i.e. "takes spontaneously". In these cases the subject was expressing an interest in the focus of the partner's activity and taking it over. A similar function was evident in actions of a different form, the infant or mother handling a toy immediately after the partner had released it ("follows in manipulation"). It was considered that when the infant took an object offered by the mother, she was expressing a similar communicative function as when she took spontaneously, since in both cases the infant was attracted to the object the mother was holding and showed a desire to handle it herself.

The three different types of communication identified, giving directives for the partner's action on an object, directing the partner's attention to an object and taking up the partner's interest in an object, provided the basis for placing the communicative actions with objects into superordinate groups distinguished by their psychological functions. Giving directives for an action using an object and their appropriate compliant responses formed Group 6 of the behaviour categories. Directing the partner's attention to an object and the redirections of attention in response to such directions, e.g. following a point or gaze, comprised Group 4, and actions taking up the partner's interest in an object formed Group 1.

In addition, three other groups of communicative actions with distinctive functions were identified. One comprised actions

expressing some degree of conflict in attempts to control or resist physically the partner's action (Group 2), while another consisted of actions to support the partner's action and to accept her interventions (Group 3). The subjects' imitations of actions on objects and actions performed as demonstrations to be imitated, made up another group (Group 5). The communicative actions of Groups 1, 2 and 3 are unsolicited responses to an action of the partner's, while those of Groups 4, 5 and 6 comprise initiatory communications directed to the partner's attention or agency and the appropriate replies.

Transcripts of the video-tapes were made giving information on both the mothers' and infants' vocalisations, actions and direction of gaze on a time chart marked out in five second blocks (Appendix C). These were then coded using the categories of communicative actions defined.

3.7 RELIABILITY OF DESCRIPTIVE CATEGORIES OF COMMUNICATIVE ACTION

A reliability check of the video-tape codings of the categories of communication about objects was conducted by comparing the author's codings with those of an experienced infant observer, Dr. Lynne Murray, who was not involved in designing the study or defining the categories. Dr. Murray was asked to learn the category descriptions and then code four sections of video-tape, each of four minutes duration (i.e. 13% of the recordings) and showing different subject

pairs at different ages in the teaching condition. The results showed an eighty four percent agreement on all categories combined. Many of the categories of action were used infrequently. Reliability coefficients were calculated only for the more commonly occurring communicative actions, mother "indicates a locus" (eighty six percent) and "demonstrates" (eighty three percent) and infant "complies" in response to mother "indicates a locus" (eighty eight percent) and "follows in manipulation" (seventy seven percent).

The investigator conducted a reliability check on her own coding of mother and infant behaviours during the condition "play without toys". One session for each of three mother-infant pairs at different ages, i.e. ten percent of the recordings, were transcribed and coded again independently of the original transcription and coding which was carried out eighteen months previously. The agreement between the two sets of coding was ninety four percent.

CHAPTER FOUR: IDENTIFICATION OF INFANT COOPERATION

In Chapter One the necessary minimum requirements for cooperative action between adults were specified. In this chapter these requirements will be examined against the behaviour of the subjects of this thesis, taking account of the limitations set on the expression of cooperation by the developing cognitive and communicative abilities of infants in the first year. The categories of communication action which were defined in this study to analyse the interactions of mothers and infants will then be reviewed to identify which, if any, can be considered to be cooperative according to the specified requirements.

4.1 REQUIREMENTS FOR COOPERATION IN INFANCY

Each of the three requirements listed in Chapter One has distinct implications for the identification of cooperation in infancy:-

A. A shared plan of action within mutual orientation. In adult cooperation the participants may have a shared plan, often worked out verbally between them, involving several steps of action to be performed over a period of time. Mother and infant have no means of establishing agreement for a prolonged sequence of actions, so their cooperation cannot have such a complex plan. It would have to consist of one partner, adult or infant, communicating an idea for joint action to be performed immediately,

indicating what the other should do to complete the joint action and followed by an immediate collaborative response. As the infant cannot speak and has rudimentary understanding of the meaning of words, the communication has to be achieved non-verbally. To identify cooperation on the part of the infant, it has to be shown that the infant is attending to and acting with reference to the indicated interests and purposes of the partner in a shared plan.

B. Cooperating partners make different active contributions to a single coordinated event. In order to cooperate, the infants would have to actively join in fulfilling or completing a plan of action with another person, or induce another person to act in such a way. Infants often watch other persons and show pleasure or other emotions when interacting with them, and this attention and emotional expression may induce a person to change his behaviour. However, for cooperation simply attending to, appreciating or imitating without adding to or changing the progress of action with the partner is not sufficient. The infants have to make clearly identifiable and well oriented actions to influence the behaviour of the partner and then mesh with the partner's actions to complete a shared purpose.

C. Willing participation. The infants have to join in cooperation by their own impulse and choice without force or coercion by the partner. Being unable to indicate by speech their willingness, they must signal agreement to cooperate by the performance of the cooperative response itself.

4.2 EXAMINATION OF COMMUNICATIVE ACTIONS TO IDENTIFY COOPERATION

The communicative actions about objects by both mothers and infants were divided into six groups on the basis of their communicative functions. Each of these groups will be examined along with the actions of person play which express similar communicative functions.

Group 1 actions, which take up the partner's interest in an object involve adopting the object or focus of the partner's action and therefore require that the subject identifies where the partner is attending and acting. In person play the infants' actions to touch the mother's hand as it moved in play (category number 63) similarly depend on recognition of the focus of the partner's attention and action. However, neither actions with objects of Group 1, nor touching the partner's playfully moving hand, take account of the form or purpose of the action and so could never be used to pursue a shared purpose.

As cooperation requires that participants become involved willingly, actions to resist or refuse the partner (Group 2 communicative actions about objects and categories 65 and 66 of person play) could not be cooperative. Actions to control the partner could be cooperative if an identifiable shared plan requires such control. The control actions of Group 2 and the category "imposes a body action" in person play, however, are all assertions by one

partner on the other when agreement to perform a controlling action has not been established.

Group 3 actions to support the partner's action are spontaneous attempts at helping, as are actions of category 67 in person play. The person performing such actions is clearly following the same aim as the partner, however entering into a shared plan is not a requirement. To be cooperative according to the definition given above, helping actions must be part of a plan negotiated and agreed to by the partners. The other Group 3 actions, those to accept the partner's action, show consent to the partner's intervention, be it to assist or control. While one partner permits the other to become involved in her action, this is done without establishing a shared plan of action with defined contributions from both of them, and so is not cooperative.

Directing the other's attention and following attention (Group 4 communicative actions) establish a shared focus of interest. Similarly, displays (categories 52-59) and touching (categories 60-62) in person play declare one person to have interest in the attentions of the other and to act to attract such attention. Shared focus of attention and mutual orientation are necessary pre-requisites for cooperation. However, they are not themselves cooperative, as both partners are not necessarily active and there is no shared plan to direct their attention.

Demonstrations using objects (Group 5) are defined as actions to

show a transformation of objects that the mother wants the infant to copy. This desire was often expressed in the mothers' speech which was, presumably, not understood by the infants, and the mothers made no other explicit or unambiguous signals that were perceptible to the infants to induce them to perform the desired action. Demonstrations are therefore not part of a cooperative sequence as they do not clearly establish a shared plan of action. The imitations in communication about objects were copies of solitary actions or communicative ones like displays as well as of demonstrations. Similarly, the subjects' imitations in person play were of a variety of movements and vocalisations, some of which were solitary or non-communicative in purpose. In imitating the subjects were taking up the partner's action and so in one sense they both had the same goal or purpose, to create that event. However, taking up this goal was spontaneous and had not been agreed between them, and so according to the definition was not cooperative.

Communicative actions about objects in Group 6 are those for giving and complying with directives. In giving directives a mother invites the infant to join in and complete the mother's purpose by performing an action that is specified by the mother's gesture. An infant may comply appropriately with the directive, respond in another way, or apparently ignore it. When the mother's directive is complied with by the infant, the subjects are cooperating according to the definition used in this study, as they held a shared plan which specified the infant's contribution and is

entered into by the infant without force or coercion. In addition there are six categories of communicative action (numbers 46, 48, 49, 71, 72 and 75) in which an infant uses gestures to direct the mother to act in particular ways. In using these the infants initiate a plan of action in which they define how the mother should act to contribute to it. The mothers' compliance does not depend on force or coercion by the infant, but is a willing response.

Actions of personal attention and emotional expression include looks at the partner's face and changes in facial expression which convey different affective states like smiling, laughing, crying and disgust. These may be used in combination with other communicative actions, including cooperative ones. However, they are not themselves cooperative as they are not concerned with communicating ideas about goals for joint action.

The examination of the categories of communicative action leads to the conclusion that directives and their appropriate compliant responses comprise the cooperation that the mothers and infants entered into when communicating during this study. This should not lead to the assumption that all directives and compliant responses in the communication between mothers and infants are necessarily cooperative. Instances in which the infant acts from a motive of fear or as a result of submission to unreasonable authority could not be considered to be cooperative. The origin of cooperation as identified in the above discussion will be investigated next.

CHAPTER FIVE: COOPERATING USING OBJECTS

This chapter sets out to describe mother-infant cooperation with a toy when the mothers were following instructions to teach the infants and to play with them using a toy (see pp. 41-2 for a description of these observational conditions). Then attempts will be made to identify which theory of social behaviour best accounts for the evidence about the onset of infant cooperation.

5.1 THEORETICAL PREDICTIONS

Four theoretical explanations described in Chapter Two are taken as constructs to guide analysis of the communication. Each theory makes different predictions about the origin of infant cooperation.

A. Social learning theory as proposed by Gewirtz (1969, 1971, 1972 and 1976) predicts that circumstances, particularly the mother's desire to foster cooperation, condition the infant to be cooperative through successive approximations, the infant's behaviour being changed by reinforcements which elicit and sustain particular behaviours. The infants cannot initiate entirely new forms of cooperation with expectation of specific responses at the outset. Infant initiated cooperation arises when an action accidentally performed by the infant is perceived by the mother to be an opportunity for cooperation to which she then responds, so creating a cooperative exchange. As no specific developmental influences to

this process are recognised by the theory, cooperation could be learned by the infants at any age, within the limitations set by immature memory, perceptual processing and motor abilities.

B. Symbolic interactionism as interpreted by Lock (1978 and 1980) hypothesises that the mother's interpretation of infant behaviour causes the infant to become cooperative; that is, cooperation arises when the infant by chance performs an action to which the mother responds as if it was cooperative. The infant is considered to be incapable of planning any new cooperative act but can perform those which have been previously interpreted to be cooperative and reinforced. This explanation can be seen as a form of social learning theory.

C. Observational learning theory (modeling) proposed by Bandura (1969 and 1977) predicts that infants learn new actions by imitating other people. This leads to the prediction that demonstrations would be the most effective way of teaching an action. The infants do not initiate new forms of cooperation though they might imitate cooperative actions previously performed by the mothers. This theory recognises that development in cognitive mechanisms influences the acquisition of behaviours. So training an infant to perform actions on objects can only be effective after the infant has become able to imitate actions on objects which Piaget (1962) first described as occurring during stage 4 of the sensorimotor period, i.e. at the end of the first year.

D. The theory of infant intersubjectivity proposed by Trevarthen (1974, 1979 and 1980) predicts that during normal playful interactions between mother and infant in which the mother is trying to assist the infant, the infant would begin to cooperate from his own initiative through an intrinsic growth of the psychological mechanisms that identify persons and their actions on objects. Then as the mother discovers her infant can and wants to cooperate she will give more directives to her infant anticipating cooperative compliance. Once the principle of cooperation is conceived by the infant, he is considered to be able both to respond to novel directives and to create novel directives for the mother. This behaviour begins when the infant's understanding of other persons has reached the appropriate level of development which will occur at roughly the same age in all infants because it arises from a self-regulated cerebral growth process. As intersubjective understanding is a general ability it is expected that when they begin to cooperate, infants will show other related changes in communication. Specifically it is expected that there would be an increase in actions aimed at directing the mother's attention or following it as indicated in other studies of infant communication, e.g. showing off and pointing (Bates, 1976) and spontaneously placing an object in the mother's hand (Bruner, 1975).

5.2 METHODS

The behaviour of the mothers and infants in the two conditions using objects (teaching and playing with a toy) were coded according to

the procedure described above. Most of the analysis was concerned with those actions identified as "directives and following directives" (Group 6 of the behaviour categories). In addition, some evidence about the subjects' other forms of communication, outwith cooperation (Groups 1 to 5 of the behaviour categories) were examined.

The first part of the results is concerned with identifying which partner initiated cooperation, how this was done, what response was called for and how the partner responded. The frequencies of the mothers' and infants' cooperative actions were calculated to identify any change during the course of the study in the incidence or type of cooperation. On the basis of the previous research (Trevvarthen and Hubley, 1978) it was expected that the infants would begin to comply with directives during the study (at about 45 weeks of age) and that they would do so with increasing frequency thereafter.

The examination of the mothers' and infants' contribution to cooperation involved analysing the frequencies of mothers' directives to establish whether these changed during the study and if so, whether there was evidence that the change was due to a development in the infants' behaviour as predicted by the theory of infant intersubjectivity. The procedures adopted by the mothers interacting with the infant were examined to establish whether the infants' cooperative behaviour was shaped by reinforcing successive approximations, modelled on the mothers' or the result of interpretation by the mothers. In addition, the mothers' responses to the infants'

compliance with directives were identified and analysed to establish whether these cooperative actions could be maintained through conditioning. The infants' directives were compared with the mothers' behaviour to find out whether these actions of the infants were imitations of or otherwise dependant on the mothers' preceding behaviour, or whether they could be described as novel directives created by the infants.

The frequencies of actions aimed at directing the mother's attention or following it (Group 4 of the behaviour categories) were analysed to establish whether these increased as the infants grew older. This was done to test the prediction, based on the theory of infant intersubjectivity, that these actions appear and increase at the same time as infant cooperation because they all arise from a general development in the infants' interpersonal understanding. In addition, the infants' other non-cooperative communicative expressions (Groups 1 to 3 and 5 of the behaviour categories) were examined to establish any concomitant change with the growth of infant cooperation or whether they may indicate any precursor to it.

5.3 RESULTS

The two instructions given to the mothers, to play with the infant and to teach her, resulted in differences in their communication about objects which help to clarify the nature of infant cooperation. In the teaching condition both subjects concentrated their activity

on the required task, while during play with a toy they showed more varied behaviour (Table 5.1). Despite these differences there were important similarities of behaviour in the two conditions.

5.3.1 Description of mother-infant cooperation - At the end of their first year all the infants cooperated in simple tasks with their mothers. While most of the cooperation was initiated by the mothers, some of the infants also gave directives to their mothers.

The mothers had two ways of giving directives. In one they identified an object or place by gesture so indicating that the infant use it for manipulation. This type of directive involved the mother noting the infant's interest in an object and by drawing the infant's attention to another object or receptacle communicating that this new topic could be incorporated into the infant's manipulations. Mothers also attempted to direct the baby by demonstrating a desired action with a toy and then holding out the toy for the infant to perform the same action. While some of these directives were for similar actions of rearrangement or combination requested by gestures alone, many demonstrations were for actions that used toys to create interesting displays, e.g. vocalising or blowing into a toy, or looking through the clear globe of the rattle.

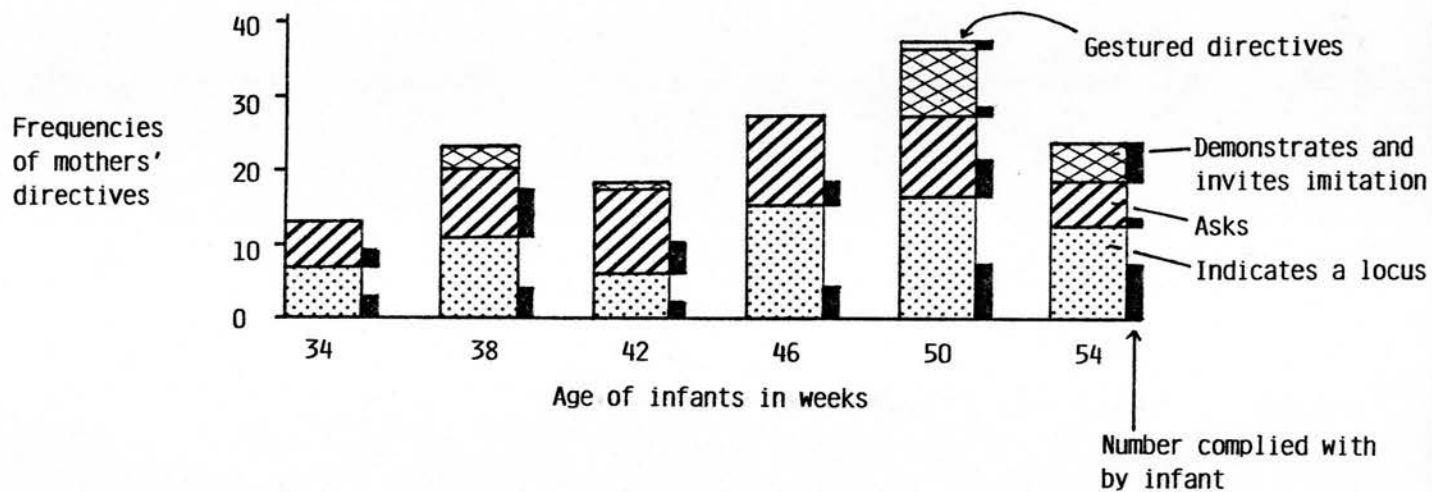
In the teaching condition seventy eight percent of the mothers' directives were gestures indicating that the baby should put a doll inside the truck (Figure 5.1). Usually the mother pointed or

TABLE 5.1 SUMMARY OF RESULTS OF DIFFERENCES BETWEEN TWO CONDITIONS
OF COMMUNICATION WITH OBJECTS

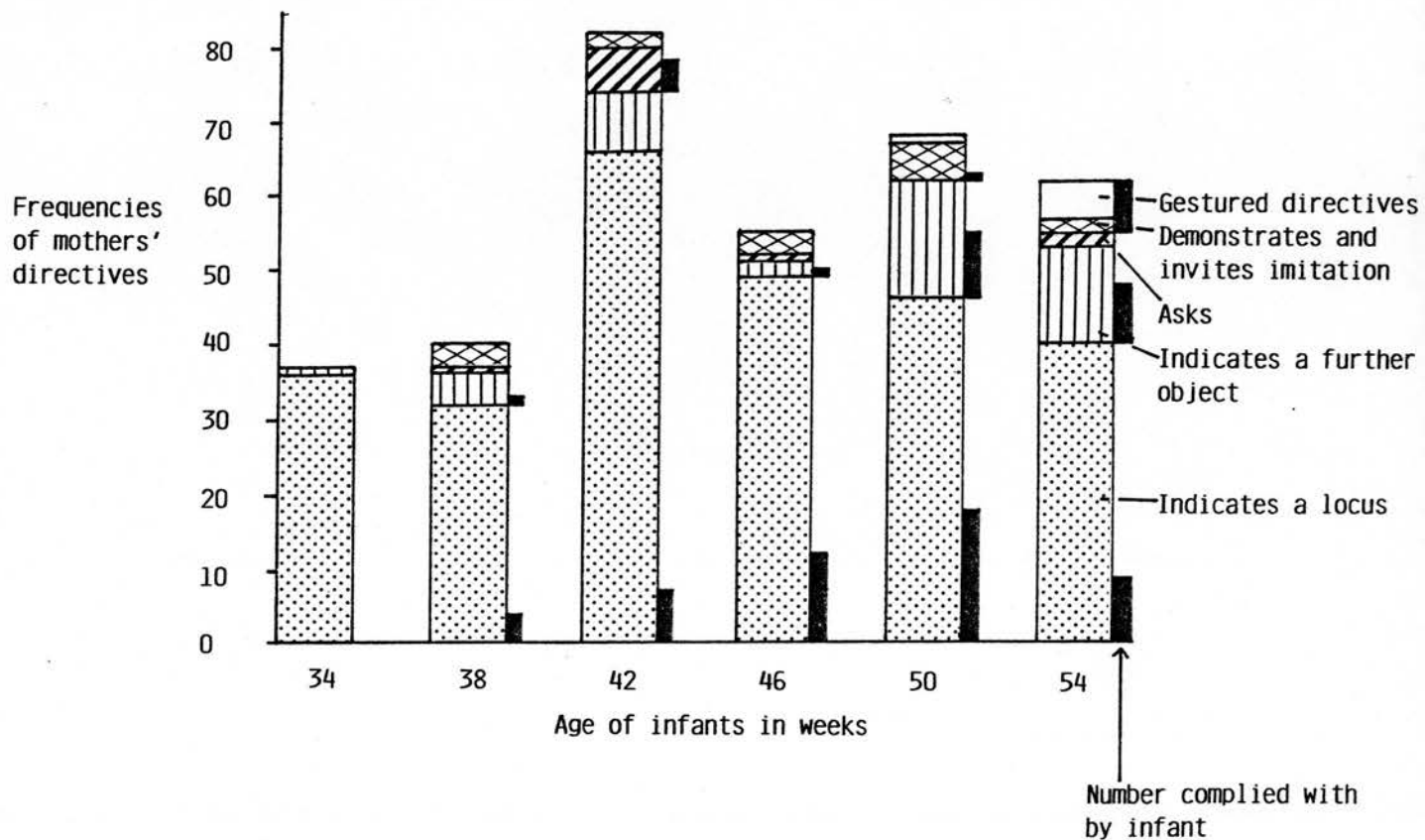
Behaviour	Play with object	Teaching
<u>Mothers</u>		
takes up infants' interest (Group 1)	higher frequency	lower frequency
supports or accepts infants' action (Group 3)	higher frequency	lower frequency
directs infants' attention and follows attention (Group 4)	higher frequency	lower frequency
demonstrates and imitates (Group 5)	lower frequency	higher frequency
"gives directive"	lower frequency	higher frequency
"performs object display"	more frequent than "indicates an object", wider variety	less frequent than "indicates an object", smaller variety
"indicates an object"	wider variety	smaller variety
"changes configuration"	wider variety	smaller variety
<u>Infants</u>		
takes up mothers' interest (Group 1)	higher frequency	lower frequency
"provokes"	lower frequency	higher frequency
"imitates"	lower frequency	higher frequency
"gives directives"	higher frequency	lower frequency

Figure 5.1 Frequencies of mothers' directives for infants' action on objects and number complied with by age of infants. Results for all subjects combined.

Condition: Play with toys



Condition: Teaching



tapped inside the truck, a form of action called "indicates a locus" (Figure 5.2A). Another directive "indicates a further object" accounted for thirteen percent of the mothers' directives in the teaching condition. Immediately after the infant had put one doll into the truck the mother held out another doll with the implication that the infant was to take it and repeat the action of putting into the truck (Figure 5.2B).

During play with a toy each of the mothers gave fewer directives than when teaching (mean frequencies were twenty eight during play and sixty nine while teaching). However, in the play condition too "indicates a locus" was the most common directive made by each of the mothers and accounted for forty eight percent of their directives. This usually consisted of the mother holding out the globe or handle with its hole or cup uppermost and moving it close to the infant so that the latter could put the ball in (Figure 5.2C). Another form of signalling consisted of the mother pointing or tapping inside the container. In all cases when the infant had turned her gaze to look at the toy before the mother made her action, the mother's gesture was categorised as "anticipates action" and not as a directive. This was done to try to ensure that it was the mother's gesture that attracted the infant's attention to the toy and communicated the idea for action.

In both teaching and play conditions the mothers gestured for the infant to give an object by holding out the hand, i.e. "asks" (Figure 5.2D). Apart from this action the gestures used by the

Figure 5.2 Mothers' directives

A. "Indicates a locus", Eliza 47 weeks.

Left - Mother points into the truck showing infant where to place the wooden doll that the infant is holding.

Right - Infant places the wooden figure into truck.

B. "Indicates a further object", Alison 50 weeks.

Left - Infant places a wooden figure into truck.

Right - Mother offers another object for the infant to repeat her action and place it in the truck.

Below - Having taken the object from the mother, the infant complies and puts it into the truck.

C. "Indicates a locus", Ann 46 weeks.

Left - Mother points into the globe showing the infant where to put the ball she is holding.

Right - Infant complies with the directive by placing the ball inside the globe.

(Note: Figures at the bottom of each picture show from the left hundredths and tenths of a second : seconds : minutes : hours : date : month.)

A



B



C



Figure 5.2 Continued

D. "Asks", Vanessa 42 weeks.

Left - Mother holds out hand palm up.

Right - Infant places the ball she is holding in the mother's hand.

E. "Indicates an action with an object",
Laragh 54 weeks

Left - Infant pushes finger into the hole in the base of a wooden doll.

Right - Mother inverts another wooden doll showing the hole in the base to the infant.

Below - Infant puts her finger into the hole of the doll the mother is holding.

F. "Demonstrates and invites imitation",
Laragh 50 weeks.

Left - Mother pretends to eat the ball.

Right - Mother then holds ball close to the infant's face, the infant leans forward and opening her mouth, presses her lips against the ball.

D



E



F



mothers did not have such specific meanings. Pointing to, tapping, offering or showing were all ways of drawing the infant's attention to a toy and so creating a new focus of interest for the infant's activity. In this way the mothers were able to communicate several meanings using similar actions which were taken up when the infants were receptive to the mother's directions. Laragh's mother on one occasion used several gestures in this generative manner to direct her infant to perform actions she had not previously used in the study (Figure 5.2E).

In the teaching condition the mothers gave fourteen directives of the form "demonstrates and invites imitation". All except one of these were directions for the infants to perform the task set by the researcher. Eighteen directives of this form were given during play with a toy when the mothers apparently felt free to explore the toy more widely than when teaching the infant a specified action. They gave demonstrations and invited imitation for a variety of imaginative displays like blowing or vocalising into the globe of the rattle, pretending to eat the ball, and holding the rattle handle to the eye like a telescope, as well as giving directives for placing an object into or out of a container (Figure 5.2F).

The results for the two conditions of communication with objects show that the infants complied with directives significantly more frequently as they grew older ($L=69$, $p<.01$)¹.

1 Many of the statistics given in this thesis were calculated using either Page's L Test or the Sign Test. Page (1963) has developed a test which assumes dependence between treatments

In the teaching condition none of the infants complied in the first sessions whereas in the final two sessions they all complied with at least twenty five percent of the mothers' directives (Table 5.2). During play with a toy, the infants showed wide variations in their percentage compliance with directives. However, four of the infants complied more as they grew older. The exception to this trend was Alison. In the earliest session of this condition her mother repeatedly gave gestured requests for her to give an object to which the infant often complied. When the infant was aged thirty six weeks the mother reported to the researcher that the infant had very recently begun to comply in this way.

Only three infants (Laragh, Eliza and Vanessa) gave directives to their mothers. All eleven instances of infant directives occurred when the infants were aged forty six weeks or older and they were performed during play with a toy. The directives were for five different types of behaviour - requesting the mother to change the arrangement of toys, to retrieve a toy, to take a toy, to imitate the infant's action and for the mother to repeat an action of her own (Figure 5.3). The mothers complied with all the infants' directives.

or trials and independence between individuals. It is a ranking method of trend analysis for three or more points and requires that the direction of trend be predicted. Unless otherwise stated, when using Page's L Test, the results from sessions 1 and 2, 3 and 4, and 5 and 6 were combined in pairs to make three groups. This was done to avoid ties in the rankings which may not be used in the calculations of this test. The Sign Test can be used for a hypothesised difference in behaviour between related groups of data. The groupings of data for this test will be given in the text.

TABLE 5.2 FREQUENCY OF INFANT COMPLIANCE (f) AND PERCENTAGE OF MATERNAL DIRECTIVES COMPLIED WITH (%) BY AGE AND SUBJECT

Condition: Teaching

Subject	Age of infants in weeks						All sessions
	34	38	42	46	50	54	
	f %	f %	f %	f %	f %	f %	
Alison	0 0	1 13	1 5	1 13	7 88	5 83	15 22
Ann	0 0	1 17	0 0	2 25	7 37	3 23	13 26
Eliza	0 0	0 0	2 50	1 20	1 17	2 40	6 25
Laragh	0 0	3 17	5 18	3 23	4 29	9 69	24 25
Vanessa	0 0	0 0	3 13	6 25	8 40	4 17	21 20

Condition: Play with toy

Subject	Age of infants in weeks						All sessions
	34	38	42	46	50	54	
	f %	f %	f %	f %	f %	f %	
Alison	5 38	7 70	3 50	0 0	0 0	3 33	18 38
Ann	0 0	2 29	2 50	3 75	1 100	0 0	8 47
Eliza	0 0	0 0	0 0	0 0	2 29	1 50	3 17
Laragh	0 0	0 0	0 0	1 20	3 21	1 33	5 20
Vanessa	0 0	1 100	2 25	4 67	8 67	8 89	23 64

Figure 5.3 Infants' directives

- A. "Indicates an action with an object",
Vanessa 54 weeks.

Left - Infant tries to place the ball inside the rattle, but is unsuccessful.

Right - Infant then holds out the ball and rattle to the mother, looking at her, inviting the mother to perform the action she cannot perform herself.

- B. "Indicates an action with an object",
Laragh 54 weeks.

Left - Infant throws the globe onto the floor and watches where it falls.

Right - She turns to look at the mother.

Below - Then the infant looks back at the object leaning forward indicating her eagerness to have the globe again.

A



B



Figure 5.3 Continued

C. "Invites imitation", Eliza 47 weeks.

Left - Infant places the ball to her own mouth looking at mother's face and the mother looks disgusted.

Right - Infant holds out ball to the mother's face for the mother to mouth it.

Below - Infant persists in her invitation and the mother complies.

D. "Indicates an action with an object", Vanessa 54 weeks.

Left - Mother repeatedly moves the globe onto and off the handle of the rattle.

Right - Infant holds out the handle close to the globe held by the mother.

Below - Infant holds the handle still while the mother places the globe onto the handle.

C



D



When the infants indicated that the mother should change the arrangement of toys they were seeking help to perform an action they could not complete on their own, dismantling the rattle. Laragh's directives for her mother to retrieve a toy were not instances of seeking help as she repeatedly threw the toy onto the floor setting up a game for the mother to join. In the directives classified as "requests imitation", the infant's preceding behaviour was not a demonstration of an action for the mother to reproduce, but a solitary action of the infant's to which the mother responded by commenting or showing interest. Noting the mother's reaction the infant then held out the toy in an invitation for her to perform a similar action. When requesting the mother to repeat an action, the infant had watched as the mother changed the arrangement of toys and then held out a toy for the mother to use in a repetition of the action.

All the directives were for simple single-step transformations on objects. There was no evidence of a request for a series of actions and most cooperative interactions took the form of a single directive followed by an action of compliance. However in the last two sessions all of the subject pairs except one (Eliza and her mother) performed sequences of cooperation in which two or more directives were complied with in an uninterrupted series. These cooperative sequences were usually maintained by the mother continuing a task. However in one case it was the infant, Laragh, who took the initiative giving a series of directives for the mother to pick up toys that the infant had thrown onto the floor, and so the infant caused them to persist in the same activity.

5.3.2 The respective contributions of mothers and infants to cooperation - The results for both conditions using objects combined show that as the infants grew older the mothers significantly increased the number of directives they gave (comparing the data from each of the six sessions, $L=403$, $p<.05$). The results suggest that the change in the mothers' behaviour could have been influenced by the infants beginning to cooperate. Analysis of the three most common types of directives given by the mothers in each condition shows that when the infants began to comply with a particular directive the mothers tended to increase the frequency of that directive (Table 5.3). This was the pattern observed in the behaviour of four mothers' use of "indicates a locus" and "indicates a further object" when teaching. The exceptions were respectively the mothers of Alison and Vanessa and their behaviour in giving these directives provided the only instances of mothers decreasing a particular directive when the infants first complied with it. Far less frequent were other types of directive, "demonstrates and invites imitation" in both conditions and "indicates a locus" and "asks" during play. However in those subject pairs who cooperated by issuing and complying with any of these directives, the mothers' behaviour showed the same pattern. They increased the frequency of the directive or began to use it in the session during which the infant first complied.

In addition to giving directives all the mothers made other communicative actions to try to teach the infants to place the dolls inside the truck. Although they frequently demonstrated what they wanted

TABLE 5.3 CHANGE IN FREQUENCIES OF MOTHERS' DIRECTIVES WHEN INFANTS BEGIN TO COMPLY

C = Frequency in the session when infant first complied
 C-1 = Frequency in the session before infant first complied

Teaching

Infants	Mothers' Directives					
	Indicates a locus		Indicates a further object		Demonstrates and invites imitation	
	C-1	C	C-1	C	C-1	C
Alison	16	8	0	8	0	1
Ann	2	6	0	5	- ^x	-
Eliza	1	4	1	2	- ^x	-
Laragh	7	14	1	4	1	4
Vanessa	3	22	2	1	0	1
Group	29	54	4	20	1	6

Play with toy

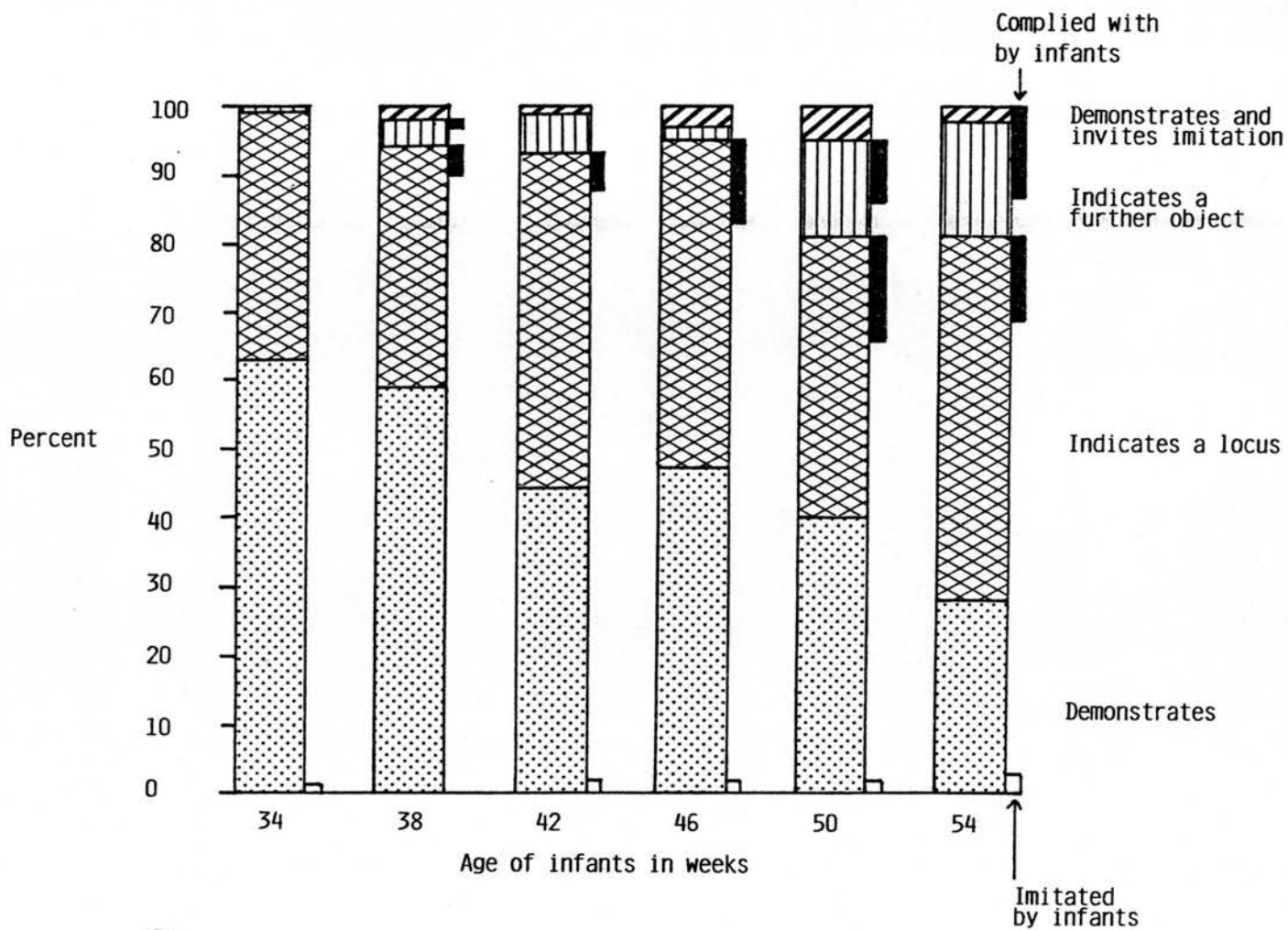
Infants	Mothers' Directives					
	Indicates a locus		Asks		Demonstrates and invites imitation	
	C-1	C	C-1	C	C-1	C
Alison	- ⁺	-	- ⁺	-	- [*]	-
Ann	0	7	0	4	0	1
Eliza	- [*]	-	2	7	- ^x	-
Laragh	4	5	- [*]	-	0	9
Vanessa	0	1	0	6	0	5
Group	4	13	2	17	0	15

- * Infant did not comply with this type of directive
- + Infant complied with this type of directive from first session
- x Mother did not give this type of directive

done, this form of communication was markedly less effective than directives as they rarely induced the required action. In all sessions the results for all infants combined show that there were only nine instances of imitation of the mother putting a toy into the truck. As the infants grew older the mothers reduced the numbers of demonstrations they gave (Figure 5.4). In the first session demonstrations accounted for sixty three percent of the main teaching actions used by the mothers (directives and demonstrations). In the final session this percentage had dropped to twenty eight percent.

Only two mothers used actions categorised as "imposes" in attempts to teach the infant the required task. This involved grasping the infant's hand, moving it to the truck and then trying to push the doll out of the infant's hand so that it fell into the truck. While for one mother (Eliza's) this was an uncommon teaching action, for the other (Vanessa's) it was the most frequent one she used in the first two sessions. However it was unsuccessful in its aim of teaching the desired action, causing the infant to resist the mother by pushing her hands away ("removes hand"), dropping the doll ("refuses"), or holding the doll out of the mother's reach ("withdraws object"). When Vanessa started complying with directives at forty two weeks her mother drastically reduced the frequency of these coercive actions. While she used "imposes" thirty three times in the first two sessions, she only did so fifteen times in the remaining four.

Figure 5.4 Percentages of different types of maternal teaching actions and infants' responses by age of infants. Results for all subjects combined.



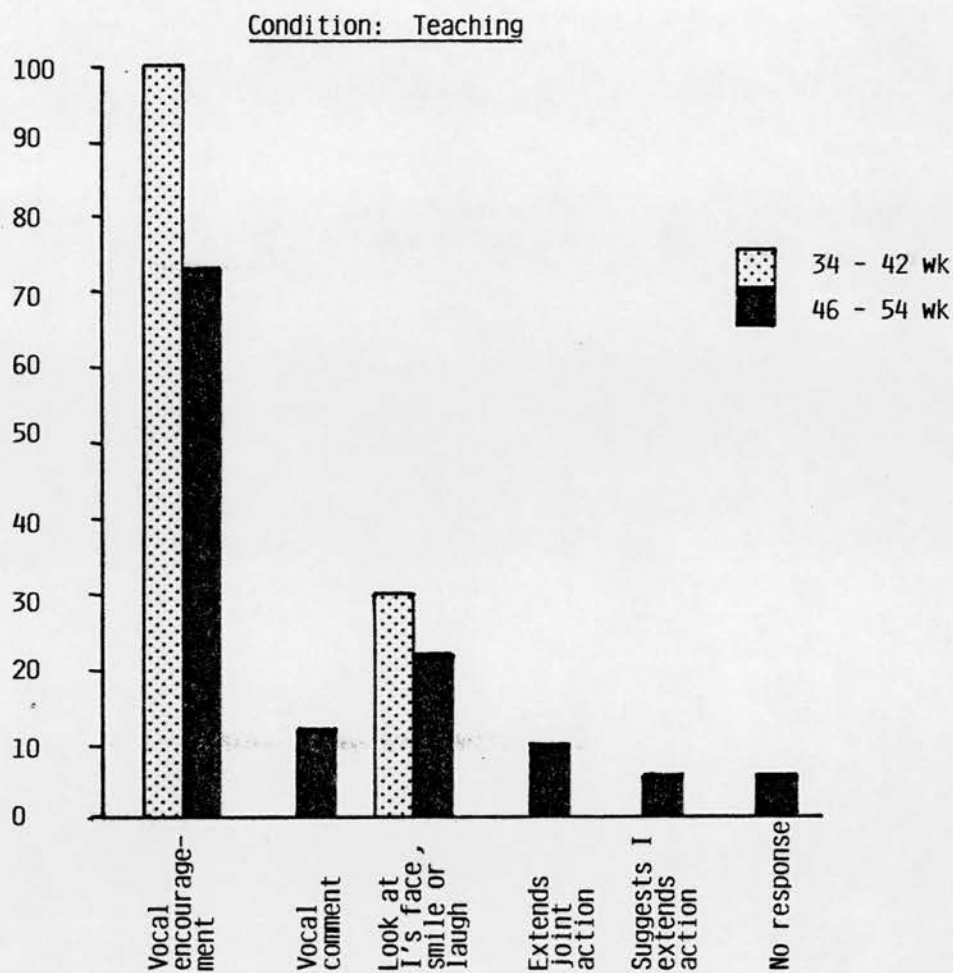
In both conditions all the mothers reacted to or commented on almost all of the infants' acts of compliance with directives. However there were condition-related and age-related differences in their responses (Figure 5.5). The most frequent response was vocal encouragement, the mother praising the infants enthusiastically, saying e.g. "Oh clever girl", "That's right", "Yes, well done", and "There we are". Actions of interpersonal attention and pleasure (looking at the infant's face and smiling or laughing) were also frequent and often accompanied vocal encouragement.

During the first half of the study the mothers showed similar patterns of response in both conditions. Infant compliance was almost invariably responded to by the mother giving vocal encouragement, and approximately one third of these were accompanied by expressions of interpersonal attention or pleasure. While teaching in the last three sessions most of the mothers responded to infant compliance in a similar fashion. However compared with their behaviour in the earlier sessions a lower percentage of the infants' actions of compliance were responded to in this way. The mothers began to extend the joint activity by performing a new action for the infant to watch, using the same object the infant had just used in complying. In addition the mothers gave further directives, suggesting ways in which the infant could continue activity ("indicates further object").

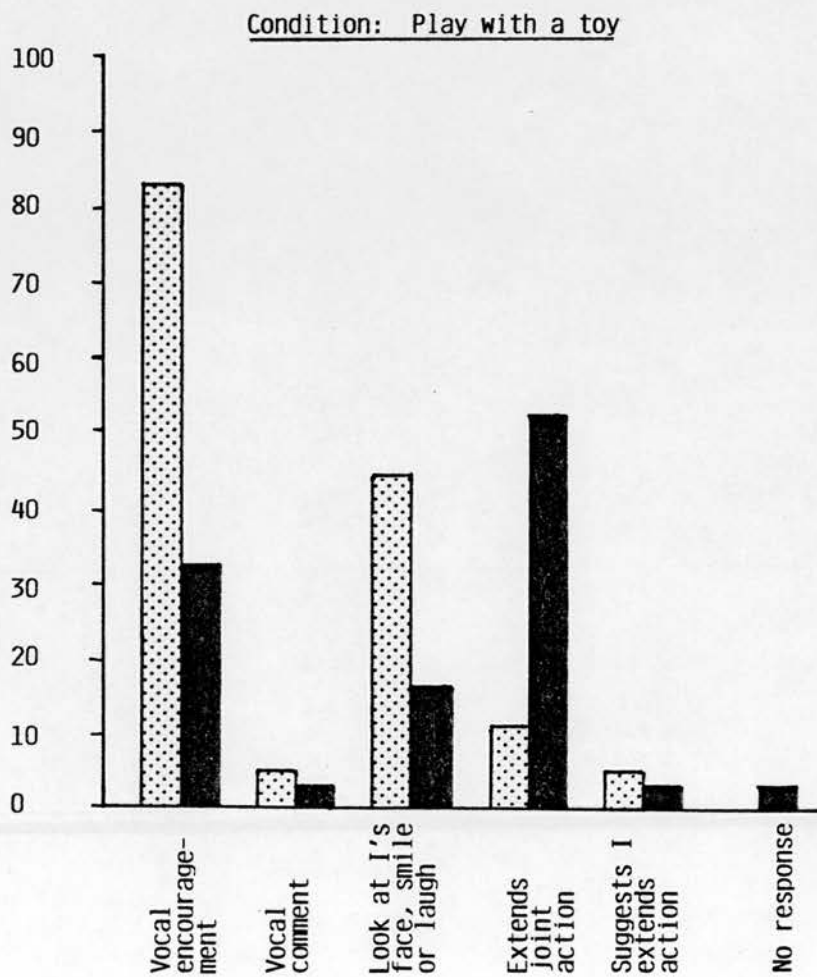
This change in the mothers' behaviour during the second half of the study was considerably more marked in the condition of play with a toy. The mothers gave vocal encouragement to only one third of the

Figure 5.5 Mothers' responses to infant compliance with directives for actions on objects. Results for all subjects combined.

Percentage of infants' actions of compliance responded to



Percentage of infants' actions of compliance responded to



infants' compliance and actions of interpersonal attention or pleasure were used in reply sixteen percent of the time. The main response of the mothers was to extend the communication by performing a new action on the object which the infants had just handled. In the teaching condition, as the infants grew older the mothers were continuing to concentrate on encouraging on the action required by the task which the experimenter had set them. By contrast during free play with a toy, as the infants grew older mothers treated infant compliance not as an end in itself, but as an opportunity for further joint action.

When the mothers were teaching their infants there was no evidence that they conditioned the infants' behaviour by reinforcing successive approximations, with vocal encouragement and expressions of interpersonal attention and pleasure when the infant moved the doll close to the truck, put a hand into it or hit a doll on the truck. Mothers only responded when the infant correctly placed a doll in the truck. While "indicates a locus" and "indicates a further object" were both commonly used directives, other forms of directives given by some of the mothers were of rare occurrence. They arose in the course of interaction and were in most cases performed only once giving no opportunity for training the infant's response. Nonetheless eight of twelve such rare directives were complied with correctly and promptly (Table 5.4).

Infant compliance was a response to the mothers' actions, but the infants' directives were spontaneous actions. The mothers in no way trained the infants to give directives, though they did encourage

TABLE 5.4 MOTHERS' RARE DIRECTIVES AND INFANTS' RESPONSESMothers demonstrate and invite imitation

Infants and age	Directive	Frequency	Response
Laragh, 38 wk.	M blows into globe and holds out toy for I to copy	2	No compliance
Vanessa, 42 wk.	M holds globe to own eye and offers toy for I to copy	1	No compliance
Laragh, 50 wk.	M vocalises into toy and offers toy for I to copy	7	No compliance
	M pretends to eat toy and offers toy for I to copy	2	Complies with first directive
Vanessa, 54 wk.	M blows into toy and offers toy for I to copy	5	Complies with all directives
Alison, 54 wk.	M sets doll upright in truck and points to toy for I to copy	1	Complies

Mothers' gestured directives

Infants and age	Directive	Frequency	Response
Laragh, 50 wk.	M points to dolls in truck and to table for I to take dolls out of truck	1	No compliance
Vanessa, 50 wk.	M hides toy in hands and holds out fist for I to find toy	1	Complies
Laragh, 54 wk.	M points I's free hand to indicate I may use that hand to remove toy from finger	1	Complies
	M holds doll upsidedown showing hole in base for I to put finger in	1	Complies
	M points to dolls on I's fingers for I to repeat action of putting dolls into truck	1	Complies
Vanessa, 54 wk.	M points I's hand and doll in truck for I to take doll out	1	Complies

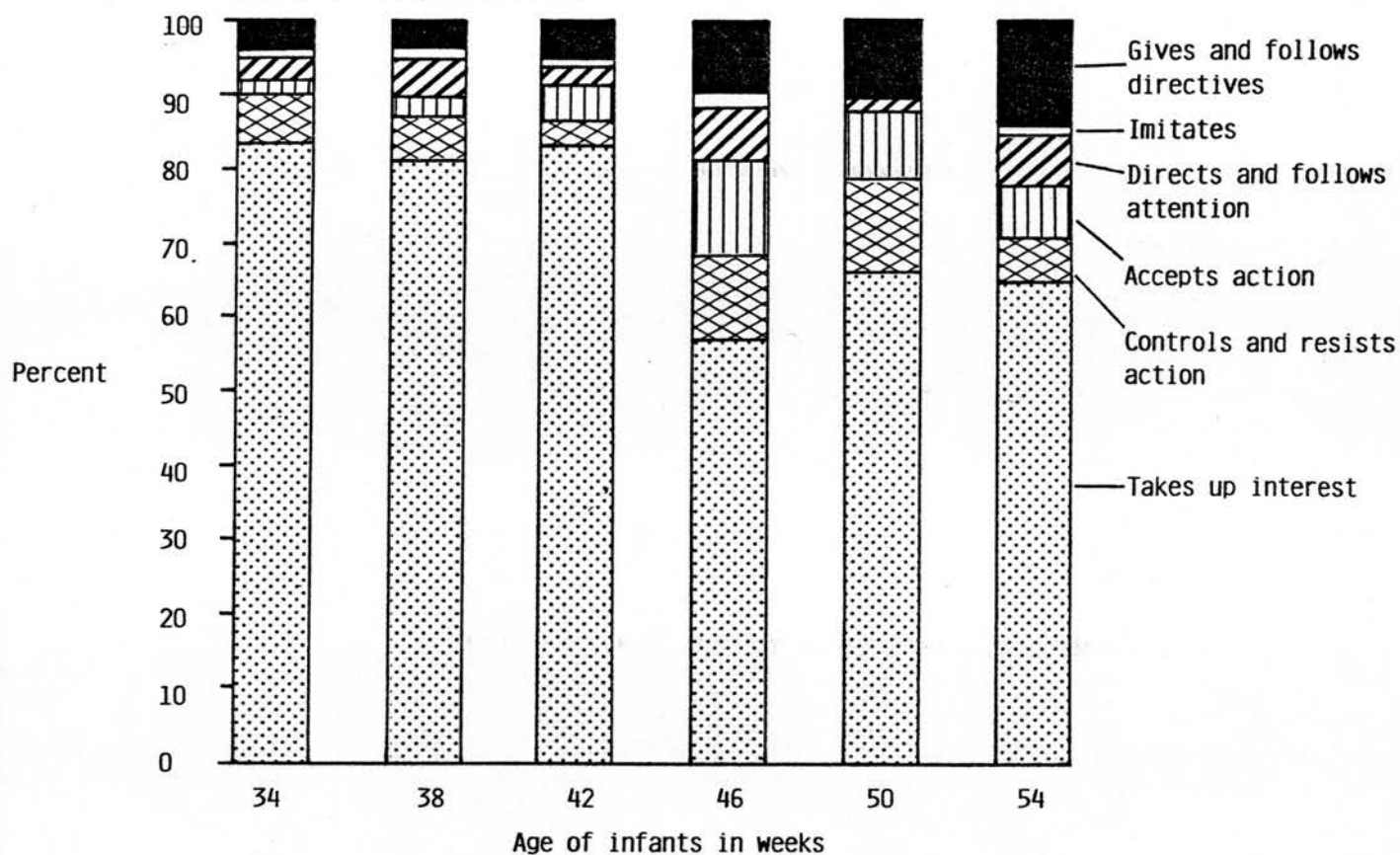
or reward them by complying appropriately. These directives given by the infants were not imitations as they called for behaviours that were different from those required by the mothers' preceding directives. Further the evidence shows that the infants gave directives for actions which the mothers had not previously performed in that session. For example, two infants (Laragh at forty six and fifty four weeks and Vanessa at fifty four weeks) gave directives for their mothers to dismantle the rattle with no model from the mother.

5.3.3 Cooperation and other communicative actions - In addition to beginning to cooperate in the performance of simple tasks, the infants showed other changes in their communication at the end of the first year (Figure 5.6). In accord with the findings of other studies (p.66), the infants performed actions to direct or follow the mother's attention (Group 4 of the categories of communication about objects, Figure 5.7). The results for the two conditions combined show that none of these actions were performed during the first session and that during the course of the study they became significantly more frequent ($L=68$, $p=0.01$).

The infants sometimes spontaneously imitated the mother's action on a toy without having been directed to do so. While the group results indicate that imitation of actions on objects was more frequent in the second half of the study, not all individuals showed this trend. Imitation was infrequent for all infants, occurring nineteen times in all sessions during both conditions. In addition to imitation there were other behaviours which showed the infants

Figure 5.6 Infants' communicative action with objects
expressed as percentages by age of infants.
Results for all subjects combined.

Condition: Play with toys



Condition: Teaching

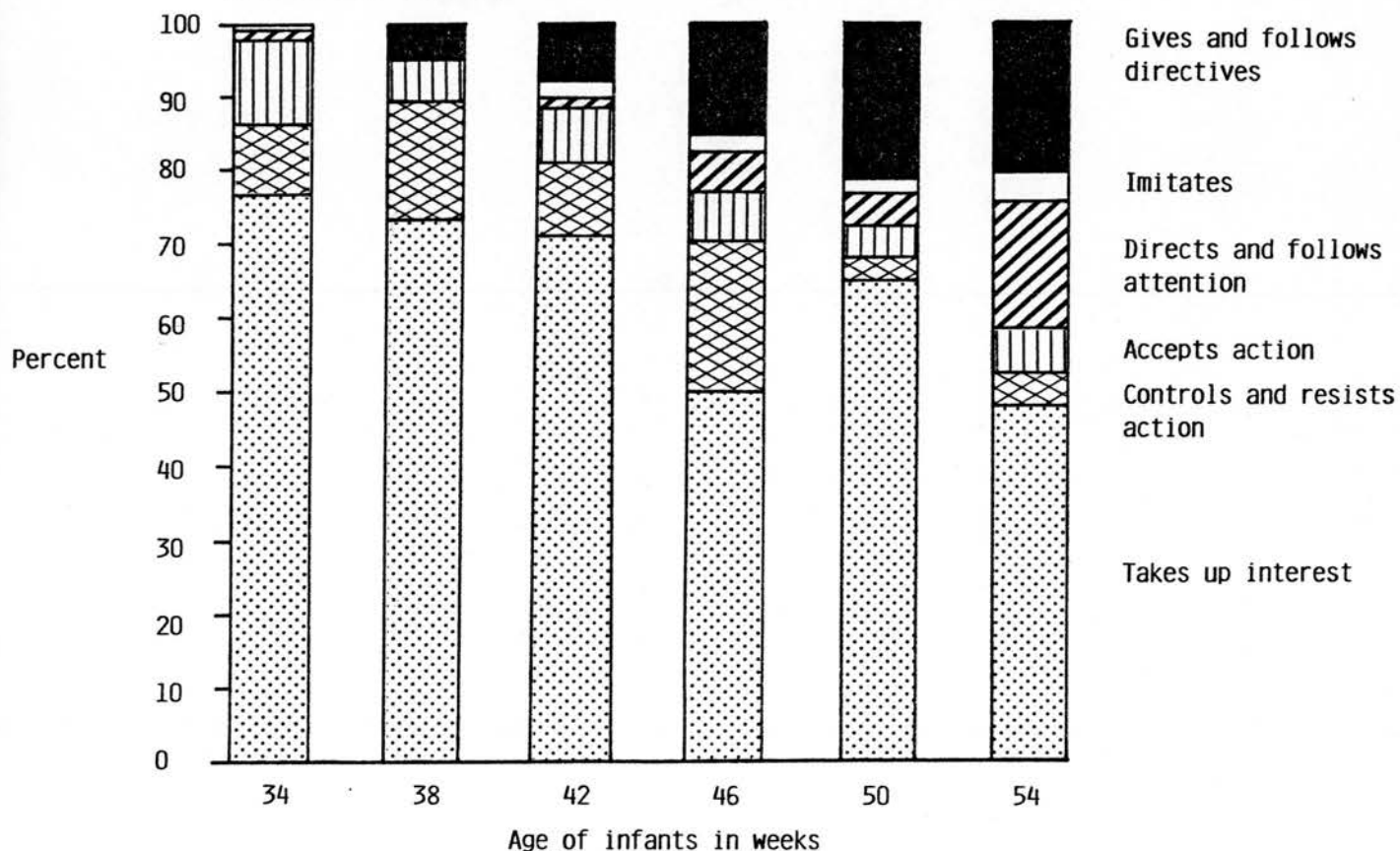


Figure 5.7 Infant actions to direct mother's attention to an object.

A. "Performs object display", Eliza 51 weeks.

Infant holds out the rattle and waves it.

B. "Performs object display", Ann 54 weeks.

Infant holds up the wooden dolls and hits them together.

C. "Gives spontaneously", Laragh 46 weeks.

Left - Infant pushes a wooden figure into mother's mouth.

Right - Mother opens her mouth to receive the toy as the infant pushes it into her mouth.

D. "Provokes using object", Vanessa 54 weeks.

Left - Infant holds a toy to her mouth and looks to the mother who makes a facial expression of disgust.

Right - Mother tries to pull away toy from the infant's mouth ("regulates object for own purpose").

A



B



C



D



taking over the mother's action. Following the mother's use of "imposes", the infants sometimes performed a similar action ("repeats imposed action"). However this was rare, occurring only once during play with a toy and five times in the teaching condition. One infant even imitated a mimed demonstration in which the mother performed the action on an imaginary object. This unusual form of demonstration was used twice each by two mothers. In all cases the object was being held by the infant and the mother was trying to show the infant an action she could perform with it.

There were no changes with age in the infants' use of communicative actions to control or resist the mother's action (Group 2) or to accept her action (Group 3). However each of the infants reduced the frequency of actions taking up the mother's interest (Group 1) as they grew older. The group results show that these behaviours comprised seventy seven percent of the infants' communicative actions in the first session of the teaching condition while in the last session they fell to forty eight percent. Similarly in the condition of play with a toy these actions showed a drop in percentage from eighty four in the first session to sixty four in the last. In this kind of action an infant manipulates an object which the mother is already handling or one she has released immediately before. By definition the infant does not handle the object in a similar manner to the mother nor does the baby attempt in any way to relate the form of activity to the mother's. Often when the mother began to manipulate another object, the infant followed and started to handle that object too. In both conditions these actions

taking up the other's interest were the infants' most frequent type of communication, and almost one fifth of the mothers' actions took this form also.

As well as showing sequences of cooperative activity with their mothers, some of the infants were fluently integrating cooperation with other activities or switching rapidly between cooperation and other forms of communication. In the final session Laragh's mother elaborated their cooperation by counting the dolls as they were put into the truck and the infant approximately imitated these sounds while complying with the directives. Vanessa at fifty four weeks was able to attend at the same time to two tasks, one set by the mother and the other continuing her own interest. She alternately complied with her mother's directives and continued her exploration of the toys. Another example shows this infant at the same age paying attention both to the task set by the mother and to her own attempts to influence the mother. In a sequence lasting seventy seconds she repeatedly showed off by blowing "raspberries" and teased the mother using provocative actions ("provokes") while twice complying with directives to do something else.

5.4 DISCUSSION

The predictions about the origins of infant cooperation made by social learning theory have not been supported by the results. The mothers did not shape the infants' behaviour through successive

approximations to the required action. Learning theorists could claim that the increase in compliance as the infants grew older was a learning curve, that it gave evidence of the infants having been conditioned by the mothers who reinforced accidentally correct actions. However the infants' cooperation was not maintained by social reinforcement. They increased their actions of compliance even though as they grew older a lower percentage of these were followed by social reinforcement while the mothers began to respond to compliance with actions to extend the joint activity. This was particularly apparent in free play with a toy when the mothers were not confined to focusing on a single task. While the mothers did indeed encourage the infants' action, naming this behaviour "social reinforcement" only gives a general description that does not specify the precise nature of the event. The mothers were giving feedback to the infants informing them that this was the action they desired, so confirming the infants' interpretation of the mothers' communicative intent.

The infants did not learn to cooperate by imitating the mothers' action as proposed by observational learning theory. Infant imitation was an uncommon action and the mothers reduced their unsuccessful attempts to elicit this behaviour as the infants grew older. Though the mothers did give some directives for the infants to imitate a demonstrated action, this procedure was used infrequently when teaching a task. Observational learning theory cannot account for the infants responding correctly to the mothers' gestured directives or for the infants' own directives none of which were imitations of directives given by the mothers.

Symbolic interactionism does not explain early infant cooperation as, according to this theory, each maternal directive for different actions could only be replied to correctly because initially the infant fortuitously performed the required action and this was then shown to be correct by the mother's response. However most of the rare directives given by the mothers were immediately responded to with the required action and there was no evidence of the mothers training the infants. In addition, the infants' directives to the mothers were infrequent and so gave no opportunity for the mothers to build an interpretation. The mothers complied without hesitation indicating that they understood what the infant wanted and did not have to cast around to find some adequate form of response. For many months the infants had been handling objects and the mothers had been responding to the infants' behaviour. Why was it not until the end of the first year that the infants started to use their action to influence the mother and showed responsiveness to the mothers' directives? If infant cooperation was governed by conditioning or interpretation by the mother, there is no apparent reason why cooperation should not have occurred earlier.

The results are consistent with the view that there must have been a change in the infants' capacity for detection of and response to human expressions of interest, purpose and emotion. According to the theory of innate infant intersubjectivity, the origin and increase in infant cooperation, involving both giving and following directives, is the result of growth in the infants' understanding of what persons are doing and how to join in. This is a generative

ability that apparently allows the infant to present new meanings in communications. It is not possible to state unequivocally that any of the infants' communications in this study were truly novel because only a small part of their behaviour was sampled. However, some of the infants did give directives for actions not previously made in that session using a toy of which they had little experience. The finding that the mothers modified their behaviour when the infants started to cooperate, increasing their use of cooperative forms, provides evidence that this was an endogenous development in the minds of the infant subjects to which the mothers adapted. The concomitant change in communicative actions to direct and follow the mother's attention supports the proposition that cooperation is based on a general development in understanding of human action and attention.

While imitation of actions on objects was rare, the group results show an increase in frequency as the infants grew older. There is evidence from other studies that infant praxic imitation may be becoming more important in the second half of the first year. Pawlby (1977) noted that this type of imitation became more frequent after twenty six weeks and found a major increase from thirty five weeks. Piaget (1962) while not investigating imitation in terms of frequency or placing particular importance on imitation of actions on objects, gave his first examples of such imitations when the infants were aged seven and eight months. These involved simple actions like hitting a toy or scratching a surface. Piaget

then gave several examples of praxic imitation when the infants were aged twelve months or older.

While this topic needs further study, there are indications that praxic imitation may be becoming more frequent at the same time as the infant is showing new understanding in communication about action and attention.

It may be argued that there are problems in drawing conclusions on the basis of small samples of behaviour. Four weeks elapsed between recording sessions and it is not possible to discover how infant cooperation was influenced during those periods. Despite this there should have been evidence of the mothers shaping, interpreting or modelling the infants' cooperative behaviour during the recording sessions if any of these processes had created it at home.

The results raise a number of issues about infant cooperation that remain to be explained. It is not obvious why a mother, making a gesture like tapping or pointing, should be an effective directive for an infant. Usually in adult cooperation such an action would be accompanied by a verbal comment understood by the recipient of the directive. However it may be assumed that the infants did not understand any of the utterances made by the mothers. When making a gesture, a person is not performing a complete action, but is using an action to draw attention to a particular object or place essential to the required rearrangement of objects. It would appear that the

infant used knowledge about agency to grasp the particular focus and intention of the mother's action and so was receptive to the communicative force of her gesture. The mothers did not have to exhibit assertiveness or power in getting infants to comply with directives. They had only to share an idea about objects through a simple gesture for the infants to fulfil the mother's expressed intention by their own agency.

Either directives or demonstrations could be used to elicit the same infant action, but gestured directives were responded to more readily by the infants than were complete demonstrations of what to do. The reason for this could lie in the fact that gestured directives were attempts to extend the infant's action and interest while demonstrations involved drawing the infant's attention to the mother's action and then redirect the infant's action according to that pattern. The distinction between the mother taking up the child's communicative intentions or introducing novel ones of her own may be of general importance in communicative development. Cross (1978) found that when conversing with their children the mothers of children with accelerated language development used speech which substantially matched the communicative intentions of the child and they introduced fewer novel topics than did the mothers of children with normal language development.

The infants had to rely on the mothers' knowledge of the joint action when giving directives. It could be argued that this showed their egocentrism in not clarifying what the mothers' contribution

should be. This interpretation however misses the essential achievement of the infants that they expected and wanted the mothers to act to help them. Further it ignores the evidence that the directives were clearly directed to the mothers and sometimes the required action was made more explicit by the infant placing the toy at or near the correct place for performance. A better interpretation may be that the infants assumed, not inappropriately, that the mothers had been attending to their action and so understood what the infants were trying to do. However this was no more than the infants themselves had to do in order to understand many of the mothers' directives which also relied on the infants' knowledge of the mothers' previous activity.

Further it appears that reliance on context is normal and desirable in adult communication. Discussing the importance of context in language use, Clark and Clark (1977) point out that natural utterances are condensed using such forms as ellipsis and pronominalization, and that the missing elements from sentences can only be determined from the context in which they are given. When outlining his cooperative principle, Grice (1975) gives quantity of information to be provided as one aspect of cooperation. According to this the contribution should be as informative as is required and not more informative than is required. Here Grice is suggesting that for utterances to rely on context is both conversationally suitable and cooperative, and it appears that infants too can use context to determine the meaning or purpose of an action as well as in emitting a communicative action themselves.

Infant actions to take up the mother's interest were the most common communicative actions in all sessions, indicating that the infants were interested in the mothers' activity and were attracted to join in. In this simple form of response the precise way they manipulated the object they took over was not the same, nor was it related to the mother's activity. As the infants grew older these actions were to some extent replaced by more sophisticated communication in which the infants took over the mother's object and they employed it in a manner specified by her directive or aimed at directing her action or attention. In that it shows a tendency to create a focus for joint action, taking up the mother's interest appears to be an important precursor to cooperation and other communication that acted on the agency of the partner.

The results confirm that at the end of their first year the infants started to cooperate with their mothers in simple tasks on objects. This ability appears to be part of a general change in the infants' abilities to comprehend and express personal agency. The findings about this development cannot be explained in terms of the mothers' conditioning, modelling or interpretation, but indicate that there may be a major endogenous change in the infants' psychology which induces these new behaviours, and this explanation will be investigated further in the following chapters.

CHAPTER SIX: COMMUNICATION IN PERSON PLAY

In their study describing infant cooperation, Trevarthen and Hubley (1978) drew attention to the importance of social play in the interaction between mother and infant in the months preceding the onset of cooperation. In these games the mother acted to attract and lead the infant's attention as she created climaxes of shared excitement and pleasure. Trevarthen and Hubley distinguished object play defined as games centred around the manipulations of objects, and person play which involves creating direct interpersonal effects not mediated by the use of objects. These are both forms of social play, shared with another person and distinct from solitary play.

The subsequent description of cooperation was concerned solely with the joint manipulation of objects and included no investigation of cooperative action in interactions not mediated by objects, person play. Trevarthen and Hubley suggested that the beginnings of cooperation involve the infant combining his privately held knowledge about the physical world and his communication addressed to other persons. This position makes no reference to developments of communication in the already established person play and leaves open the issue of whether the onset of cooperation influences its form and structure. If, as proposed by the theory of infant intersubjectivity, cooperation arises out of an endogenous change in the infant that affects his understanding of other persons, then this change should be apparent in the humorous, playful interpersonal exchanges

as well as in serious joint exploration of objects, and it should be possible to trace this development in the communications expressed in person play.

While psychological research has tended to keep separate the areas of social play and serious communication, there is support for the proposition made by the theory of infant intersubjectivity that these are closely related because both are expressions of the infant's interpersonal understanding. Garvey (1977) in her study of linguistic play in young children has suggested that similar processes are involved in both social play with language and language in serious communication. In identifying the main abilities underlying social play, Garvey (1974) described some criteria which could equally well apply to other forms of communication. One ability she considered necessary for social play is recognising and acting according to rules of reciprocity. Another necessity for social play is the ability to create together an activity and to develop it according to a shared image.

In order to investigate the nature of the person play of mothers and infants, alternative explanations and the evidence on the structure and form of games given by psychologists researching infant play will be examined in an attempt to identify important factors in accounting for social play. Then predictions derived from the theory of infant intersubjectivity about mother-infant play will be tested against the evidence found in this study on social play both directly between mothers and infants and also using objects.

6.1 EXPLANATIONS FOR THE FORM OF SOCIAL PLAY

Piaget (1962) described a theory of play related to the general process of intellectual development. He stated that in infancy serious attempts to understand or interact with the world involve adapted equilibrium between assimilation and accommodation in applying representational schemas. However in play the schemas are applied without the usual level of accommodation to the constraints of the world and with a high degree of assimilation modifying external reality to the desires of the infant. This Piaget believed allowed the infant to acquire "a feeling of virtuosity and power" (1962, p.89).

For Piaget there were three main types of play which succeed each other in a developmental sequence. The first, practice play, involves the infant's earliest circular reactions of body movement. Circular reactions, a concept Piaget attributed to J. M. Baldwin, are repeated without any attempts at adaptation in an exercise of schemas re-exciting sensory effects for the sole purpose of the "pleasure of functioning". This type of play appears at about two to three months of age during stage two of the sensorimotor period and Piaget considered it to be the only type of play used by infants during their first year. Precursors of the next type of play to appear, symbolic play, are apparent in the ritualisation in stage four of the sensorimotor period. Piaget gave the example of his daughter, Jacqueline, at nine months who, on seeing her pillow unsmilingly went through the actions she normally made before going

to sleep. He stated that for this play ritual to become symbolic the child should not just go through the habitual movements, but should also be aware of the make-believe. This according to Piaget does not occur until the final stage of the sensorimotor period.

As an example of this transition he described Jacqueline at fifteen months holding a cloth with fringed edges similar to her pillow lay down blinking as though closing her eyes in sleep and laughed.

This Piaget considered to be an early example of the infant showing awareness of pretence characteristic of symbolic play.

The third type of play Piaget described, games with rules, generally appears during the period of concrete operations and it is the earliest example of social play, play between people, that Piaget described. He suggested that play with rules is the playful activity of the socialised being and obedience to rules involves the notion of obligation between people. In his work on moral development, Piaget (1932) traced the stages he observed in children playing marbles and described the interpersonal rules governing their play. The infant, however, does not use rules, but performs rites the regularity of which anticipates the rules of future games. Even though he noted the importance of social expectations and interaction in the play of mid-childhood, the play behaviours Piaget described for infants were those for handling toys and not those for personal interaction.

Piaget noted Charlotte Buhler's description of the interest that infants show in other people, but he concluded that this showed either that infants are interested in what is "big, powerful and

mysterious", or that "inter-individual relations based on admiration and unilateral respect are stronger than those based on cooperation" (1932, p.82). He apparently perceived no adult involvement in the play of infants. Giving an account of the play of his daughter Jacqueline at the end of her first year, he did not describe the adult's response or contribution even though the infant's play occurred in close contact with adults and could well have been demonstrative. He described the infant performing a "ritual as a joke" (1932, p.22), though it appears that he saw this as a private joke for the infant alone.

So in considering infant play, Piaget's egocentric conception of infancy focused his attention on solitary play and apparently led him to fail to take account of infant social play with adults. However other investigators taking a cognitive developmental approach have recognised that infants and mothers play together. Sroufe and his colleagues (Sroufe and Wunsch, 1972 and Sroufe and Waters, 1976) put forward a cognitive developmental interpretation of infant play and used a theory of tension reduction to account for smiling and laughter. Discrepant stimuli leads to "tension", an unclear concept they borrowed from Kagan (1971) and Berlyne (1969) and was originally derived from Freud. When an infant successfully assimilates a stimulus onto existing schemas, the tension is relaxed and smiling occurs. Alternatively incongruous information which is not brought into harmony with existing schemas will result in crying as the tension is not relaxed.

Their theory carries unresolved implications. First, all the events a baby laughs at should be those he would have responded to by crying at an earlier age when he could not assimilate these discrepant stimuli onto existing schemas. However there does not seem to be any evidence from Sroufe or any other researcher that this occurs. Second, if an incongruous or unexpected event is a sufficient elicitor of baby laughter, then infants could be expected to laugh frequently in non-social play. While smiling in mastery during solitary play has been documented (Piaget, 1953), such solitary activity is typified as serious, while smiles and laughs are typical of social situations (Schaffer, 1971). Third, a given form of play, once it is no longer related to the growing edge of cognitive ability, should disappear. However many games like chasing and looming persist and cause laughter into childhood and beyond. Sroufe and Wunsch (1972) themselves found that babies laughed at mothers making mechanical or unusual noises or movements, but adults too laugh at "funny" voices or accents or unusual movements, witness Monty-Python.

Why should mothers' behaviours studied by Sroufe and Wunsch (e.g. stroking the baby's face, pulling a cloth away from the baby or crawling across the floor) be funny to the infants if the mother may perform similar acts in other circumstances and not be laughed at (e.g. wiping the baby's face, taking away an object she genuinely does not want the infant to handle, or searching for something on the floor)? Perhaps it is not the behaviours themselves that cause laughter, but the manner of performance. When investigating primate

communication, Bateson (1955) found that he had to take into account that the animals he studied played together. This he believed could only occur if the animals were capable of some degree of meta-communication meaning that they were able to exchange signals qualifying their behaviour by indicating that "this is play". Garvey (1974) taking up Bateson's idea discussed the signals that children use to mark a transition to a state of play including attenuation and exaggeration of gestures as well as laughter, smiles and giggles.

Sroufe and Wunsch (1972) did not report any signals given by the babies or mothers to indicate when they were playing. The restrictions imposed by the experimenters, who were trying to obtain comparable stimulus situations, may well have limited the subjects' use of a playful manner. Indeed it was found that following attempts to make items more uniform, the behaviour became more mechanised and spontaneity was reduced. The interpretation given by these authors ignored all aspects of the interpersonal understanding necessary or sufficient for laughter in the social situation they were studying.

Other explanations for infant social play have employed concepts about the quantity or timing of the stimulation of the adult's action. In a cross-species study of play-fighting Aldis (1975), using an evolutionary explanation for the origin of play, considered that play provided training for the young in skills of defence. However he points out that in contemporary human life these skills

are no longer vital for survival. However he considered the functions of mother-infant play as helping attachment by stimulating the infant and so rewarding the mother and promoting social contact. He defined play as behaviour that makes a baby laugh and suggested that the broader the grin and the louder the laugh, the more effective is the reinforcement for the mother. Though he offered no supporting evidence, Aldis claimed that vigorous physical games are more stimulating than and preferable to quiet non-physical play like looming, clapping and face-pulling. However this explanation relating the motivation for play to the quantity of stimulation leaves unanswered questions about the measurement of stimulation. His emphasis on eliciting intense expressions of pleasure from the infant limits the mother's role in play and he also failed to recognise the variety of the infant's contribution to play by suggesting that except for laughter, infants under fifteen months are passive in play.

Watson (1972 and 1979) found that eight week old infants coo and smile when a mobile moved contingent to their own activity (head or foot movement). He suggested that this perception of and responsiveness to contingency underlies all infant social behaviour including play. According to Watson "people become important to the infant because they play 'The Game'" (1972, p.338), i.e. because adults behave contingently in responding to the infant's action. Watson's account, like that of Aldis, fails to include the full range of the behaviour of both adult and young infant in a social interaction, assuming that the infant only smiles, coos and watches as he was found to do with a mobile and that the adult

responds contingently like a mechanical toy. Further his contention that the infant's response to the mobile would be the same as that in a social interaction has been questioned by Dunkeld (1979). She found that infants' smiles to the mobile involved only the mouth while in social interaction with either a stranger or the mother, the smiles were broader and included movements of the face muscles.

Studies of mother-infant social play suggest that there are standard or predictable changes with age in the contributions made by infants and these show growth in the infants' understanding of communication. Initially infants are generally appreciative watching, smiling and laughing at adult play actions, but it is not until the second half of the first year that they start actively controlling moves in the games, e.g. imitating expressions and movements and touching the mother's face (Trevvarthen and Hubley, 1978) or controlling the screen in Peek-a-boo (Bruner and Sherwood, 1976). In his developmental scales, Illingworth (1980) included the item of infants making jokes by repeating performances that have caused other to laugh as behaviour expected of forty week olds. At the same age Bates et al (1975) have documented similar behaviour which they term "showing off".

Teasing was defined by Drever (1964) as "a form of social behaviour, playful or aggressive, in which one individual appears to try to annoy by relatively slight annoyances, another". Aggression mixed with enjoyment of engagement is typical of playful teasing, but Drever's definition leaves the cause of annoyances unclear.

Teasing in play is indeed a complex activity involving the leader in action on the recipient's intentions and requiring the recipient to perceive the contradictory or opposing intentions expressed by the leader. Further the participants have to discriminate whether this activity is to be taken as playful and friendly or too aggressive and therefore hostile. Notwithstanding the complex interpersonal nature of teasing it has frequently been described in the play of infants and their mothers. Evidence indicates that infants under one year are teased by their mothers (Trevvarthen and Hubley, 1978; Trevvarthen, 1979; Aldis, 1975), and Urwin (1978) documents its use by mothers with blind infants. Bretherton and Bates (1979) have described infants teasing their mothers after they have begun to "show off".

The foregoing discussion suggests that in studying infant social play care is needed in applying a cognitive developmental approach because although knowledge of physical relations may indeed be important, in social games understanding and use of interpersonal processes themselves may be the major and critical factor.

Attempts to find explanations for social games in terms of physical quantity or contingency of stimulation apparently ignore the evidence of interpersonal action and influence and offer an inadequate description of the infant's contribution to play. There is evidence of infant play changing in accord with their communicative abilities and this will be further examined by testing predictions made by the theory of infant intersubjectivity in the analysis of social play.

6.2 PREDICTIONS ABOUT SOCIAL PLAY

The theory of infant intersubjectivity suggests that for infants aged eight to twelve months:

1. Social play will be directed by rules based on the mutual regulation of interpersonal attention, action and affect. As the infants' abilities to communicate develop, the forms of social play will change accordingly.
2. As they grow older infants will perform new play actions that show an increased understanding of interaction with people, e.g. they will begin to perform displays involving body movements for the mother's attention at about nine to ten months of age when they begin to perform displays using objects.
3. The infants and mothers will cooperate in social play as they have been shown to do in communication using objects, and cooperation will become more frequent as the infants grow older.

6.3 METHOD

The behaviour of mothers and infants in the three conditions, play without toys, play with toys and teaching, was transcribed and coded according to the procedure described in Chapter Three. The coded transcripts were then analysed to identify when the mothers

and infants played together. Trevarthen and Hubley (1978) describe the exaggerated and repeated expressions and gestures used in play by a mother and her infant. These behaviours marked the activity as being playful by creating a comic interpersonal effect.

Exaggerated and repeated expressions and gestures along with smiling and laughter were used in this study to define the state of play.

A game was considered to have begun when both partners became clearly engaged with each other and were not attending to another activity. The game ended when one or both partners withdrew attention. Only communication identified as playful was included in the analysis. Serious manipulation of objects and distressed behaviour were excluded.

Object play and person play were distinguished from each other and analysed separately. In general person play did not involve the use of objects, but there were a few exceptions. In these the play did not centre around manipulation or control of the object, but a personal effect was created using an object. These exceptions were, hiding the face with a paper tissue, holding a tissue in the mouth and shaking it, or pretending to blow the nose with the tissue.

The play was analysed to establish the kinds of interpersonal communication achieved. Play actions used by mothers and infants were identified and then the response of the partner was used to judge its effects. The purpose or function was inferred from the distinctive form and manner of the initial action taken in

conjunction with the partner's reaction. For example, for an infant action to be considered a "body display" it had to stand out from the rest of the infant's behaviour and be clearly directed at the mother. Further, the mother had to respond to this, or to an equivalent action, in a manner that showed she considered it to be a display created by the infant for her attention, e.g. by smiling, laughing, copying, modifying the action or commenting on it. All the play behaviour was examined in this way to identify consistent rules or patterns of personal communication and to establish whether these changed as the infants grew older.

Then the infants' contributions to play were examined. The form and frequency of their responsive and initiatory play actions were established and any changes with age were noted. The play was also analysed to identify any actions of cooperation between mother and infant and to establish the initiator, form of directives and the response. Again the data was analysed for changes with age.

6.4 RESULTS

While the subjects engaged in social play during much of the condition without toys, they very rarely played together in the two conditions where objects were present. The results for play without toys will be presented first and a description of play using toys will be given separately.

6.4.1 Patterns of communication in person play

Analysis of the person play of the mothers and infants clearly showed that their play actions were used to generate interpersonal effects and that the partner's response could modify them and create a new balance of interpersonal action. Six distinct patterns of communication were identified which took the form of playful assertions aimed at regulating the partner's interpersonal attention and action.

Three of these play communication patterns (touches, shows off and controls) required only one person to be active while the other watched appreciatively, smiled or laughed and allowed herself to be touched or moved. As one partner took no active part in performing play actions, these patterns of play have been called exhibitive play, i.e. one person entertains the other by creating effects or exhibitions. The other forms of play involved both partners actively and have been termed participatory play. The same behaviours were used as in exhibitive play, but the two partners combined them in different ways creating distinct interpersonal effects. In playful opposition one person's behaviour was actively thwarted by the other's. This involved the two partners expressing contrary communicative aims, while in complementary and matching play they expressed coincident aims, one partner taking over the other's action by completing it or duplicating it respectively.

In their person play the mothers and infants gave and complied

with many directives. These were particularly important in the negotiation of complementary play but were also used by the mothers to elicit other play patterns. These directives and their compliant responses were considered to be cooperative, as defined in this study, because they involved the joint management of ideas about shared play, one person initiating and communicating a plan for the other's action and the partner responding freely without force or coercion.

The mothers led the play most of the time, commonly performing one action or a repetitive series of actions followed by others which varied in unpredictable ways. Thus they created a measured uncertainty by changing the rate, position or form of their play actions. While no examples were found of the infants varying their play in this way, they did make important contributions to play. Each of the different patterns of play will be considered in turn and the mothers' and infants' contributions, including cooperation between them will be described.

6.4.2 Exhibitive play

A. Touches - Body contact indicative of playful aggression and teasing intimacy was used by both mothers and infants (Figure 6.1). This type of play comprised most of the mothers' playful actions of touching which were usually performed two or three times in rapid succession and often reached a climax of tickling or poking the infant. In some touching games there was a build up of expectations to the climax, while in others there was sudden surprise physical contact. The nursery game "Round and round the

Figure 6.1 Touching in person play.

A. Mother "acts on face", Alison 46 weeks.

Left - Mother strokes the infant's right cheek.

Right - Then mother strokes the infants left cheek and the infant laughs.

B. Mother "acts on body", Laragh 46 weeks.

Left - Mother finger walks up the infant's stomach as the infant watches her face.

Right - Mother tickles infant.

Below - Infant looks at mother and laughs.

C. Infant "touches hand", Eliza 38 weeks.

Infant touches the mother's fingers.

D. Infant "acts on face", Alison 38 weeks.

Infant touches mother's nose and face.

A



B



C



D



garden" was included in this type of play (Table 6.1).

The infants' most frequent response to the mothers' playful touching was smiling or laughing (Table 6.2). In addition the mothers' touching the infant's hand or body was often replied to by the infant touching the mother's hand as it poked or tickled the infant. Sometimes the infants ended the game by removing the hand the mother was touching. The infants did not poke the mothers' ribs, tickle them or finger walk across the mothers' bodies as the mothers had done to them. They sometimes took the initiative and touched or hit the mother's hand or face when she was not performing a play movement. Two of the infants performed this type of play in response to their mothers' directives. In one case the infant had just grasped and released the mother's hand and the mother then moved her hand near the infant inviting her to repeat the action. The other instance was similar except the infant had touched the mother's nose. No infant gave directives for the mother to join in this type of play.

B. Shows off - These were exaggerated expressive performances by one partner for the entertainment of the other and they required no response from the partner other than expressions of appreciation of watching and smiling (Figure 6.2). Included are the mothers' hand displays which were often repeated and accompanied by vocalisations marking the rhythms of the movement. The infants attentively watched these activities then often looked at the mother's face and laughed or smiled. They sometimes touched the mother's hand

TABLE 6.1 RHYME AND ACTION GAMES

	<u>Rhymes</u>	<u>Action</u>
1.	"Round and round the garden Goes the teddy bear* One step, two step, And tickle you under there"	Circled index finger in palm of infant's hand. Finger walked up infant's arm. Tickled infant in arm pit.
	* Variations of rhyme used: "Up and down the stair" or "Like a teddy"	
2.	"This little piggy went to market This little piggy stayed at home This little piggy ate roast beef This little piggy had none And this little piggy cried, 'Wee, wee, wee', All the way home"	Waggled infant's thumb in time with rhyme Waggled infant's index finger in time with rhyme Waggled infant's middle finger in time with rhyme Waggled infant's ring finger in time with rhyme Waggled infant's little finger in time with rhyme Finger walked up infant's body Poked infant's chest.
3.	"Pat-a-cake, pat-a-cake Baker's man Bake me a cake As fast as you can. Pat it and bat it And mark it with 'B', And put in the oven For baby and me"	Variety of actions including mother clapping own hands, hitting hands against infant's and clapping infant's hands together, all in time with the rhyme.
4.	"Clap-a-clap-a handies, Clap-a-clap-a hands, Clap-a-clap-a handies, Clap-a-clap, clap-a-clap) Clap-a-clap-a handies") repeated	Clapped baby's hands in time with the rhyme throughout Here increased speed of rhyme and clapping

TABLE 6.2 FREQUENCIES OF INFANTS' RESPONSES TO MOTHERS' EXHIBITIVE PLAY ACTIONS

Results for all subjects in all sessions combined

Mothers' actions	Infants' responses				
	Looks at M's face and smiles or laughs	Smiles or laughs only	Looks at M's face only	Touches M's moving hand	Withdraws hand
Hand and body touching	21	70	28	17	11
Face touching	7	17	3	2	0
Hand displays	9	33	42	27	0
Face displays	7	35	23	0	0
Control	11	21	31	1	19

Figure 6.2 "Showing off" in person play.

- A. Mother "hides and reveals face",
Vanessa 46 weeks.

Left - Mother covers her face with hands
as infant watches.

Right - Mother uncovers her face and looks
and smiles at the infant who returns the
smile.

- B. Mother "performs hand display" and
"acts on body", Ann 50 weeks.

Top left, top right and below left - Mother
finger walks across the table, up the
mirror and across the top of the chair as
the infant follows her movements.

Below right - The mother follows the
display by tickling the infant's neck and
the infant laughs.

- C. Infant "performs hand display", Eliza
47 weeks.

Infant holds out her hands and claps them
together.

A



B



C



as it moved in making a display and on occasions they tried to catch the mother's moving hand, so changing the game to one of opposition (see below).

Also included in this type of play are most of the mothers' face and voice displays to which the infants usually replied with smiles and laughter. During face hiding and revealing play ("Peek-a-boo") the mother and infant were generally looking at each other's faces before the mother covered her own or her infant's face. Mutual gaze was re-established immediately the screen was removed, both partners usually waiting without re-directing their attention. Only twice did one infant complement the mother's action and remove the screen (see below).

Infant showing off comprised all their spontaneous hand, face or voice displays and included pretending to blow the nose, blowing "raspberries", clapping, tapping the palm of one hand with the index finger of the other hand (an action used interpersonally in the rhyme game "Round and round the garden"), and flicking the lips while humming. One mother tried directing her daughter to repeat a display the baby had just performed. She pointed to the infant's nose to get her to "blow" her nose again. However the infant did not comply because she was attempting to get her mother to perform the same action.

C. Controls - In this pattern of play one partner caused the other to submit to an imposed form of behaviour (Figure 6.3). The

Figure 6.3 Control in person play.

- A. Mother "imposes a body action",
Vanessa 46 weeks.

Left - Mother moves infant's hands waving and clapping them together as she recites the nursery rhyme, "Pat-a-cake" and the infant watches her face.

Right - The infant smiles as the mother moves her hands.

- B. Mother "imposes a body action", Ann
54 weeks.

Top left, top right and below left - Mother moves infant's fingers as she recites the nursery rhyme, "This little piggy". The infant smiles and shifts her gaze between the mother's action and her face.

Below right - The mother concludes the game by tickling the infant's neck as the infant looks at her face.

- C. Mother "imposes a body action", Laragh
37 weeks.

Mother raises the infant's hands as the infant looks at her and smiles.

A



B



C



mothers frequently accompanied imposed forms of movement with songs or rhymes. Some of these were traditional games with conventional patterns of movement, e.g. "This little piggy" and "Pat-a-cake" (Table 6.1).

The infants frequently responded to the mothers' playful impositions by smiling or looking at the mother's face (Table 6.2). However twenty three percent of the infants' responses to imposed play were actions of resistance by withdrawing their hands. When this happened the game was by definition ended. The infants' actions of playful control included clapping the mother's hands together and lifting, pulling or pushing them.

6.4.3 Participatory play

A. Matches the other's action - This pattern of play involved taking over the partner's activity by duplicating or imitating it (Figure 6.4). This group contained many displays made in playful imitation by both mothers and infants. There were also games in which a mother and infant alternately acted on each other in the same way to create a sequence of behaviours (e.g. stacking hands), or simultaneously matched each others' activity (e.g. touching index fingers together). Often the mothers and infants performed sequences of two or three imitated vocalisations or touching movements, alternating with each other.

Two mothers gave directives for their infants to perform matching play actions. These were of the form "demonstrates and invites

Figure 6.4 Matching in person play.

A. "Hand imitation" by mother and infant,
Alison 54 weeks.

Left - Infant hits the table and is rapidly followed by the mother hitting the table.

Right - Mother hits the table while the infant smiles and watches.

Below - Then infant still smiling and looking at the mother hits the table again.

B. Mother "demonstrates and invites imitation", Vanessa 50 weeks.

Left - Mother moves the infant's fingers and recites "This little piggy" while the infant watches her face.

Right - Mother holds out her hand for the infant to grasp and move her fingers.

Below - Infant complies by grasping and moving the mother's little finger.

A



B



imitation" similar to many directives given in communication using objects. They called for the infant to show off, to touch or to control the mother's movements. One infant also gave a directive for the mother to perform a movement similar to the one the infant had performed immediately before. While the directive referred to the preceding activity, the infant did not act out an explicit demonstration for the mother to copy. By holding out a paper tissue, Laragh got her mother to "blow" her own nose like the infant had just done.

B. Complements the other's action - Here one partner joined in the other's activity by performing an action that followed on from the partner's behaviour and completed it (Figure 6.5). Most directives for play occurred in this type of engagement when one partner invited the other to complement an action. The leader's contribution was to place herself in the appropriate posture for the required contribution and to invite the other to perform it. In this way the mothers directed the infants to touch them in particular ways, e.g. clap hands against the mother's, move the hand round the mother's palm in "Round and round the garden" and bite the mother's hand. Directives were also given for the infants to perform controlling actions to complete a joint performance, e.g. hitting the mother's hands together and opening the mother's fist by extending one finger at a time. Only one mother gave a directive for the infant to perform a complementary display. She held out a tissue to the infant's face for her to snuffle into it. This was a joke on behaviour when infected with colds which both mother and infant had recently experienced.

Figure 6.5 Complementing in person play.

A. Mother "indicates other's action on self" (complementary touching play), Vanessa 50 weeks.

Left - Mother holds out her hands with palms facing the infant.

Right - Infant claps her hands against the mother's and then looks at her face.

B. Infant "indicates other's action on self" (complementary touching play), Eliza 42 weeks.

Left - Mother circles the infant's palm with her index finger, reciting "Round and round the garden".

Right - After the mother has finished the game, the infant holds out her hand for the mother to repeat the game.

Below - The infant persists until the mother begins the game again.

A



B

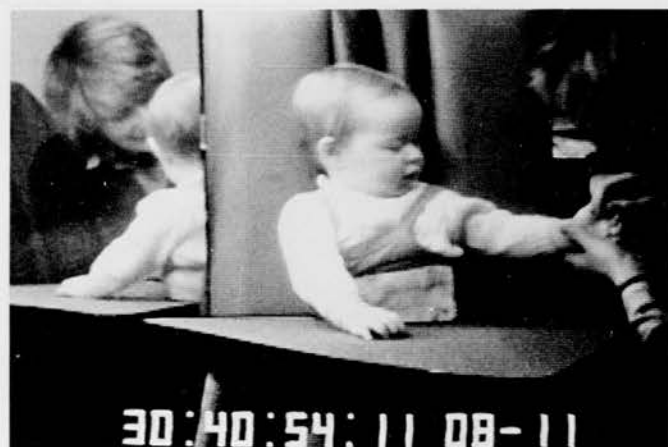


Figure 6.5 Continued

C. Mother "indicates other's action on self" (complementary controlling play), Ann 50 weeks.

Left - Mother extends the index finger of her fist as infant watches.

Right - Mother closes fist.

Below - Infant grasps and extends mother's index finger.

D. Infant "indicates other's action on self" (complementary controlling play), Vanessa 54 weeks.

Left - Mother flicks her lips and hums and the infant imitates her movement carefully watching the mother's face.

Right - Infant grasps mother's index finger and pulls it to her own mouth.

Below - Infant moves mother's finger up and down on her lips until the mother begins making the movement herself.

C



D



Figure 6.5 Continued

E. Mother "indicates other's display"
(complementary "showing off"),
Laragh 54 weeks.

Left - Mother pretends to blow her nose
as infant watches and smiles.

Right - Mother holds out the tissue to
infant.

Below - Infant leans forward and rubs
her nose in the tissue.

F. Infant "indicates other's display"
(complementary "showing off"),
Laragh 54 weeks.

Left - Holding a tissue in her mouth,
the mother shakes her head from side to
side. Then she opens her mouth and
drops the tissue.

Right - Infant holds up the tissue for
the mother to repeat the action.

Below - Mother takes the tissue in her
mouth and shakes her head again.

E



F



These directives called on the infants to show off, touch or control the mother, but they were not classified as exhibitive play because they involved a specified participation of both partners. During exhibitive play the mothers had, for example, performed nursery games such as "This little piggy" and "Round and round the garden", but they acted on the infants rather than in partnership with them.

The infants gave several kinds of directives for the mothers to make a complementary movement by touching them in particular ways. Like the mothers, the infants sometimes changed posture to invite the mother's action, e.g. holding out the hand for the mother to play "Round and round the garden" and opening the mouth for the mother to put her finger in. One infant induced the mother to flick the infant's lips by pulling the mother's hand to her mouth. While most of the infants' directives were of the kind that called on the mother to touch them, one infant reached to the mother to get her to move closer so that the infant could repeat an action on her. Here she was indicating what she wanted to do implying how the mother could help. Only one infant called for the mother to make a complementary display. By holding out a tissue to the mother's face, Laragh invited her to snuffle into it.

Fifteen of all the infants' complementary play actions were directed by the mother and ten of them were the infants' own directives to their mothers. There were in addition five other complementary play actions which were spontaneous attempts by the infants to join in with the mothers' play actions and were

classified as "assists other's action on self". These included the infant removing the screen in "Peek-a-boo". Another infant joined in complementary play by keeping her right hand at the position in which the mother had placed it while the mother clapped it and then assisted by presenting her left palm to be clapped in the same way. While in most of the controlling play actions the mothers grasped the infants' hands and moved them, one infant changed this by grasping the mother's hands, so assisting with the mother's activity.

C. Opposes other's action - This pattern of communication in play required that both partners be active with one countering the other's action (Figure 6.6). This type of play was formed by one partner attempting to control or change the other's action and there often followed a sequence of alternating opposing actions. These differed from imposition classified as "controlling play" in which the intrusion was passively accepted by the partner, not playfully countered or opposed.

A frequently played teasing game was the mother repeatedly moving her hand across the table while the infant tried to touch or grasp it each time it came near. Similar to this was the game in which the mother hid her hand under the table and the infant tried to catch it when it appeared over the edge. Sometimes after hiding her hand, a mother tapped across the underside of the table to the place where she revealed it and her infant followed the noise to anticipate correctly where the mother's hand was to appear.

Figure 6.6 Opposing in person play.

- A. Mother "hides and reveals hand" and infant "touches hand", Alison 42 weeks.

Top left - Mother shows her hand close to infant's hand.

Top right - Infant quickly grasps the mother's finger, then the mother withdraws and hides her hand.

Below left - Mother shows her hand and moves it along table edge.

Below right - Infant touches the mother's hand.

- B. Mother "indicates other's action on self" and infant changes the game by not complying with the mother's gestured directives, Laragh 50 weeks.

Top left - Mother holds out her finger inviting a repetition of the game of touching finger tips.

Top right - Infant grasps and pulls mother's finger.

Below left - Mother leans forward saying "Nosey, nose", attempting to get the infant to rub noses and the infant leans forward.

Below right - Instead of rubbing noses the infant tries to bite the mother's nose.

A



B



This gave opportunity for tricking the infant by the mother making a quick sideways movement and showing her hand elsewhere. In another common game the infant pushed the mother's hand away as the latter showed off.

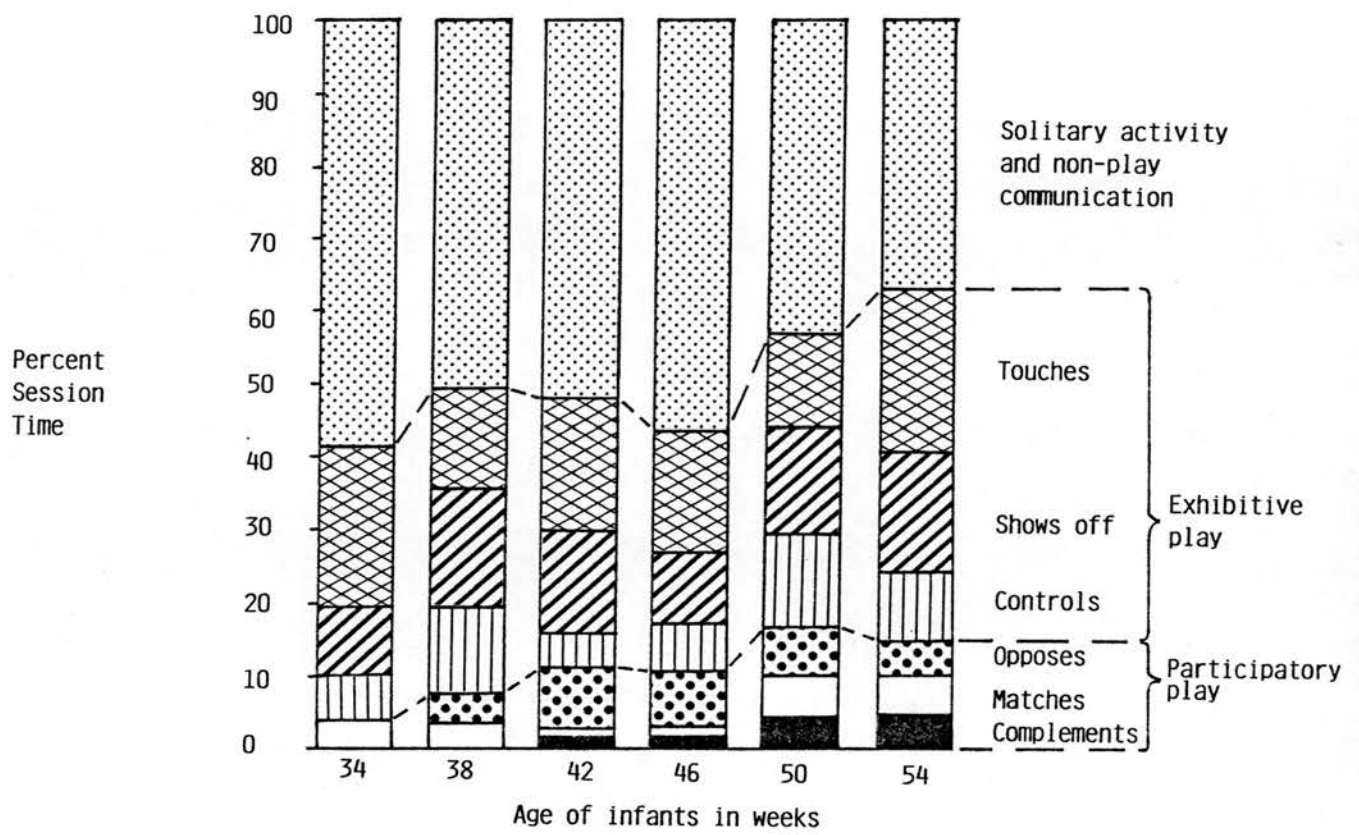
On two occasions an infant changed the game from matching the mother's activity to one of opposition. By not performing the expected action as before, she acted on the mother in a different way and so teased her. Instead of touching the mother's hand finger tip to finger tip, Laragh grabbed the mother's finger and looked at her face. Immediately following this the mother leaned forward saying "Nosey, nose", inviting her to rub noses, a game they often played, but instead Laragh bit the mother's nose and laughed.

There was only one instance of directives to evoke this form of play. The mother held out her fist to the infant who opened her fingers one by one while the mother tried to keep them closed.

6.4.4 Changes in patterns of person play

All the mother-infant pairs spent more time in both complementary and matching patterns of play as the infants grew older (Figure 6.7). This was particularly evident in the final two sessions. On average they spent nineteen seconds in matching play in the first three sessions and thirty two seconds in the last three sessions (Sign Test, $p < .05$). At the same time there was a five-fold increase in complementary play, an average of five seconds in

Figure 6.7 Duration of different patterns of person play as a percentage of session time by age of infants. Results for five subject pairs combined.

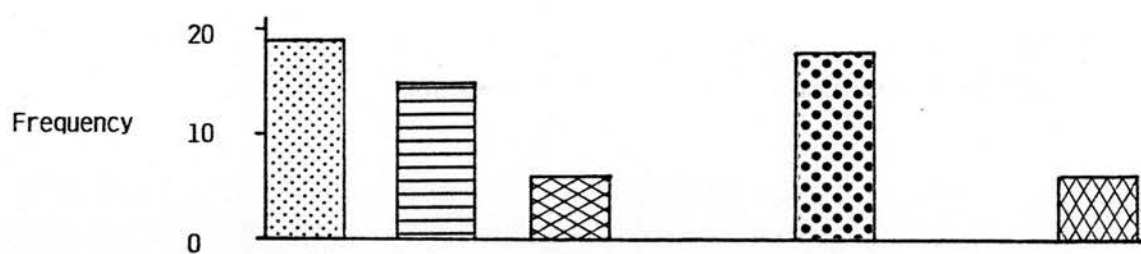


the first half of the study rising to twenty five seconds in the second half (Sign Test, $p < .05$). However there was no clear age-related change in the time they spent on other play forms. Overall four of the mother-infant pairs spent more time in person play in the later sessions (average of fifty four percent of session time) than the earlier ones (average of forty two percent). The exceptions, Laragh and her mother, showed a slight decrease with age.

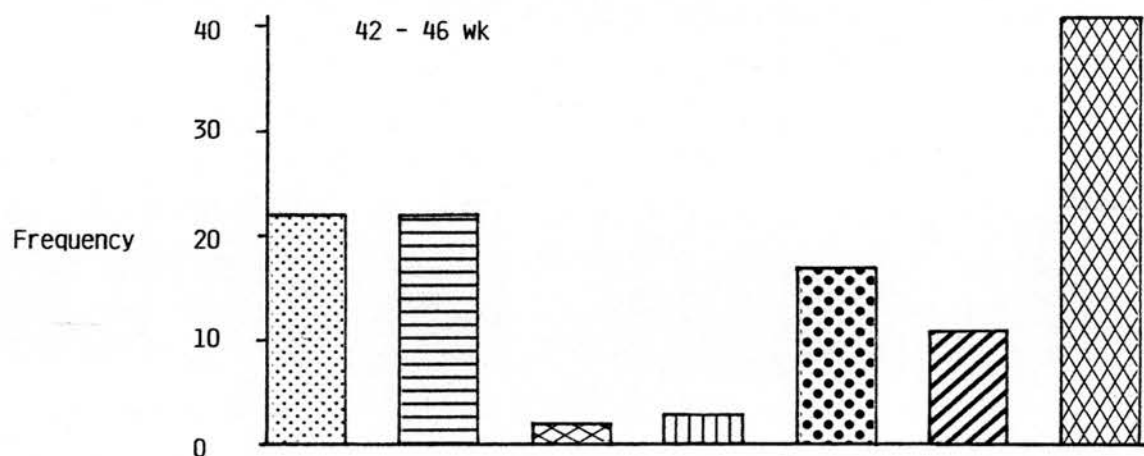
For each of the pairs considerably more time was spent in exhibitive play, in which one partner, usually the mother, was active while the other watched, smiled and submitted to the play action. On average seventy nine percent of the time devoted to play was spent in exhibitive play while participatory play accounted for only twenty one percent. All infants increased their contribution to play as they grew older making more play actions in the second half of the study than in the first. As they became older they all performed more actions to oppose the mother playfully ($L=66$, $p=.05$) and to complement it ($L=68$, $p=.01$) (Figure 6.8). No infant made any of these actions in the first session. Four infants showed similar increases with age in the frequencies of actions to show off. No infant performed any spontaneous displays in the first three sessions of the study and one infant, Ann, did not perform any of these actions. Matching the mother's action was frequent in the earliest sessions, but all the infants used more of these actions as they grew older ($L=66$, $p=.05$). There was no systematic change in the infants' use of spontaneous playful control and touching. However all the infants showed a decrease in frequency of touching the mother's hand in response to her moving it in display or tickling or poking the infant.

Figure 6.8 Changes with age in the frequencies of the different types of play action by the infants. Results for all infants combined.

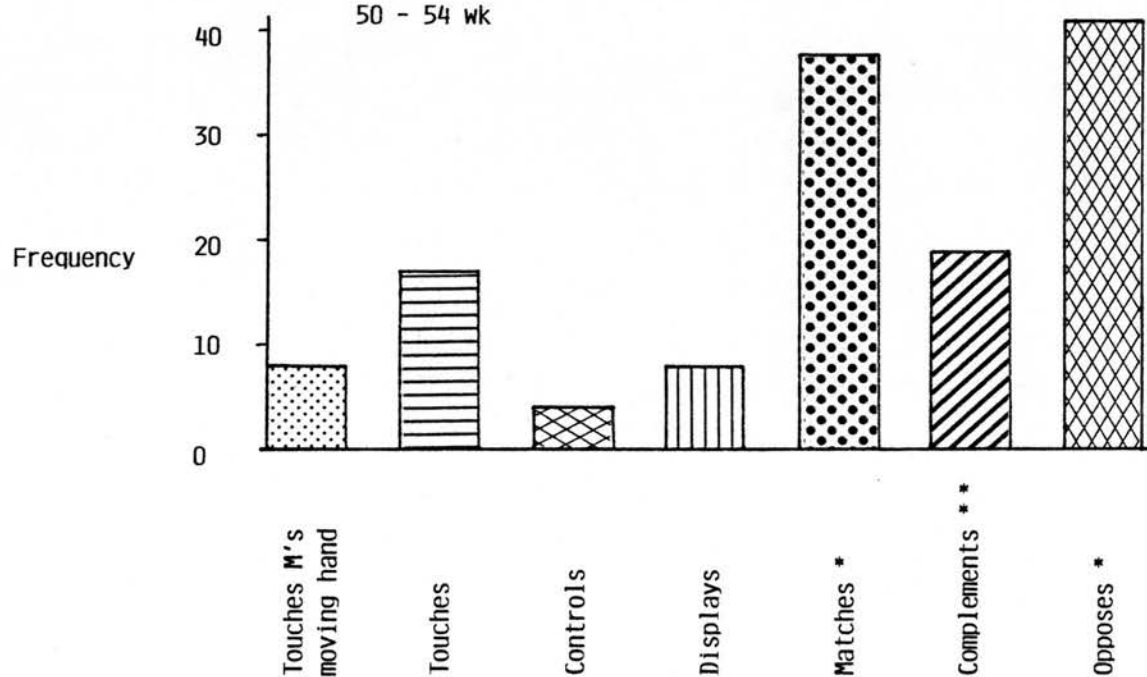
34 - 38 wk



42 - 46 wk



50 - 54 wk



Increase with age * $p = .05$
 ** $p = .01$

6.4.5 Cooperation in person play

Four of the mothers and three of the infants (Laragh, Vanessa and Eliza who all gave directives during communication with objects) gave directives for the partner's play. No infant or mother gave directives in the first two sessions and all four mothers who gave directives did so more frequently as the infants became older. It is not possible to affirm that the infants increased the number of directives as they grew older because the frequencies of these actions were very low. Nevertheless all directives by infants were given when they were aged 42 weeks or older.

Many of the mothers' directives called for the infants to repeat an action that had been performed immediately before (Table 6.3). In addition, several of the mothers attempted to get their daughters to repeat a game played at home by identifying themselves as recipient of the required action when this action had not previously been performed in the session. This technique of recalling a response from the infant's memory, while not as successful as attempts to elicit an action that had just been performed, was sometimes responded to appropriately.

The infants complied with thirty of the mothers' forty two directives and the mothers' complied with ten of the fourteen directives given by their daughters. Like the mothers, infants relied on the context of joint action to specify the required action (Table 6.4). However for the infants all the directives were based on the immediately preceding action only and in no case was

TABLE 6.3 MOTHERS' DIRECTIVES IN PERSON PLAY, THEIR RELATION TO JOINT ACTION, THE ROLES SPECIFIED AND INFANTS' RESPONSES

Type of play	Who performed the action previously	When it was performed	Roles specified by directive	Required action	Frequency	Infant response
Touching	1. Infant	Immediately before	M as recipient	Touch M's hand	1	Complies
	2. Infant	Immediately before	M as recipient	Touch M's face	1	Complies
Showing off	1. Infant	Immediately before	I as actor	"Blow" own nose	3	No Compliance
Matching touch	1. Mother	Immediately before	M as actor and recipient	Touch finger tip to finger tip	5	Complies 5 times
	2. Mother	Immediately before	M as recipient	Touch palm in "Round and round the garden"	5	Complies 4 times
Matching display	1. Mother	Immediately before	I as actor	"Blow" own nose	1	Complies
	2. Mother	Immediately before	I as actor	Looking through fingers	1	Complies
Matching control	1. Mother	Immediately before	M as recipient	Moving fingers for "This little piggy"	1	Complies
Complementary touching	1. Infant	Immediately before	M as recipient	Touch M's tongue	4	Complies 3 times
	2. Infant	Immediately before	M as recipient	Bite M's finger	3	Complies 3 times
	3. Infant	Immediately before	M as recipient	"Blow" M's nose	1	Complies
	4. Infant	Immediately before	M as recipient	Clap hands against M's hands	1	Complies
	5. Infant	Before session	M as recipient	Opening M's fingers	5	Complies 5 times
	6. Infant	Before session	M as recipient	Shake M's hand	7	No Compliance
	7. Infant	Before session	M as recipient	Clap hands against M's hands	1	Complies
Complementary control	1. Infant	Before session	M as recipient	Clap M's hands together	1	Complies
Opposes	1. Infant	Before session	M as recipient	Open M's fist	1	Complies

TABLE 6.4 INFANTS' DIRECTIVES IN PERSON PLAY, THE ROLES AND ACTIONS THEY SPECIFY AND THE MOTHERS' RESPONSES

Type of play	Description of communication	Person that performed the action previously	Roles specified by directive	Subject, age and frequency	Mothers' responses
Showing off	M takes tissue in mouth, shakes and releases it, I holds out tissue for M to take and repeat action	Mother	M as actor	Laragh 54 wk (3)	Complies
Matching display	I "blows" own nose and then offers tissue for M to "blow" her own nose	Infant	M as actor	Laragh 54 wk (1)	Complies 3 times
Complementary touch	M touches I's tooth. I opens mouth wider and M touches I's tooth again	Mother	I as recipient	Laragh 50 wk (1)	Complies
Complementary touch	M snuffles into tissue held by I and I then holds out tissue for M to repeat	Mother	M as actor	Laragh 54 wk (5)	Complies twice
Complementary touch	M plays "Round and round the garden", circling her finger in I's palm. I then holds out hand for M to repeat	Mother	I as recipient	Eliza 42 wk (2)	Complies once
Complementary touch	M leans to I and opens mouth. I puts hand into M's mouth. M leans back and I reaches to M's mouth to repeat action	Infant	M as recipient	Laragh 50 wk (1)	Complies
Complementary control	M flicks I's lip while I hums. I then starts humming again and pulls M's hand to her mouth for M to flick I's lips again	Mother	M as actor and I as recipient	Vanessa 54 wk (1)	Complies

it apparent that the infant was referring to games played at home.

In all directives calling for an infant to act on the mother, the mothers invariably identified themselves as recipients of the infants' actions by presenting the appropriate part of their body. Similarly in all directives for an infant display, the mothers identified the infant as actor by pointing to the part of the infant's body to be moved or holding out an object for her to use. These two ways of identifying the roles of the partners, i.e. specifying the self as recipient or the other as actor, could refer to action performed by either the self or the other. In this way were communicated four distinct relationships between actor, recipient and action which were used differentially in different patterns of person play (Table 6.5A). Some directives required the infant to remain as actor or leader and repeat a display for the mother's attention (A), or repeat an action on the mother (B). Others required that the mother and infant exchange positions in the actor/recipient relationship, the infant performing the action which the mother had previously used in display (C) or in touching or controlling the infant (D). Most of the infants' directives for different types of play were constructed in the same way as were those given by the mothers (Table 6.5B). In addition one of the infants gave a directive of a different form in which she identified the mother as the recipient of an action by reaching to her (E).

TABLE 6.5 COMPARISON OF MOTHERS' AND INFANTS' DIRECTIVES FOR DIFFERENT TYPES
OF PERSON PLAY

A. Mothers' directives

Action previously performed by:	M's directive specifies:	
	I as actor	M as recipient
Infant	A. Showing off	B. 1. Touching 2. Complementary touching 3. Complementary control 4. Opposing
Mother	C. Matching display	D. 1. Matching touch 2. Matching control

B. Infants' directives

Action previously performed by:	I's directive specifies:		
	M as actor	I as recipient	M as recipient
Mother	A. 1. Showing off 2. Complementary touch 3. Complementary control	B. 1. Complementary touching 2. Complementary control	
Infant	C. Matching display		E. Complementary touch

6.4.6 Communication in object play

There were some clear parallels in the mothers' actions in communication about objects and in person play (compare "object approach and retreat" and "hand approach and retreat", "object displays" and "hand displays", "hiding and revealing object" and "hiding and revealing hand", and "touches with object" and "touches").

However the infants' responses to the mothers' actions with objects were more frequently serious attempts to get hold of the toy rather than humorous appreciation. Overall, only nine percent of the communication during the two object-using conditions was humorous object play.

Although so little time was devoted to humorous object play, there was in the object play observed evidence of all the forms of social play seen when the subjects were playing without toys (Table 6.6). As in person play, exhibitive play was more common than participatory play accounting for seventy seven percent of the games using toys. The mothers led most of the time in play, though the infants made important contributions by showing off and engaging in participatory play. Over seventy percent of the participatory play consisted of opposition in which one partner countered the other's action. Some of the opposing play was similar to that seen in person play, the infant trying to catch a toy as the mother showed it. Other opposing object play centred around giving and taking toys as the partners alternately snatched the toy from each other or the infant pretended to give the toy to the mother, but withdrew it before the mother could grasp it. One of the infants

TABLE 6.6 FREQUENCIES OF GAMES USING TOYS

Type of game	Condition	
	Teaching	Play with toy
<u>Exhibitive play</u>		
M Shows off	23	19
Touches B	4	10
Imposes	3	1
B Shows off	4	8
Touches M	0	0
Imposes	1	0
<u>Participatory play</u>		
Matches	2	1
Complements	1	2
Opposes	9	7

initiated games of opposition by repeatedly performing an action (putting a toy to the mouth) which the mother consistently tried to stop. Complementary and matching behaviour was rare in play with objects, these types of action being reserved mainly for serious cooperation and imitation in the joint manipulation of objects.

The frequencies of object play were too low to establish statistically whether there was any consistent change in play as the infants grew older. However it should be noted that only three of the ten infants' displays using objects and three of their twenty one actions of opposition occurred in the first three sessions, most of these play actions being performed when the infants were older.

6.5 DISCUSSION

The predictions made about social play by the theory of infant intersubjectivity have been largely supported by the results. The play of the mothers and infants was organised in patterns of psychological functioning which express distinct interpersonal action in creating effects for the partner's experience by "touching", "controlling", "displaying", "matching", "complementing" and "opposing". Other descriptions of infant play have some of these patterns, e.g. complementary control of the screen in Peek-a-boo (Bruner and Sherwood, 1976), imitation of body movements and

vocalisations (Pawlby, 1977), playful opposition of teasing (Bretherton and Bates, 1979) and showing off (Bates et al, 1975). Further, Garvey (1974) gave evidence of comparable patterns of participatory social interaction in the language play of young children when she described responses which were identical, complementary or counter-assertive to the initial utterance. However no previous study of infant play has recognised the full range of interpersonal functions defined in this study.

As predicted by the theory of development based on an inherent intersubjectivity, the play of mothers and infants changed as the infants grew older to show an increased understanding by infants of social interaction and the more advanced participatory play to some extent replaced the undefined attempts of the infants to join in the play by merely touching the mother's hand. Only four of the infants showed a change in their tendency to display or show off for the mother as specified in the predictions. However they all took more initiative in play using an increasing number of participatory play actions based on sharing an aim with the mother. The final prediction about the appearance and increase in cooperation with age has been partially supported by the results. Four of the infants cooperated by complying with directives while three of them initiated cooperation by giving directives, and there are indications that this behaviour increased with age.

Infant performances of displays and contributions to participatory play all involve some understanding of joint action and attention

necessary to cooperation. When performing a display an infant indicated that she perceived herself as of interest to the mother and was to some extent able to take account of the mother's point of view and of the effect her action was having on the mother. An infant engaging in sequences of matching actions showed that she knew how to create similar movements and effects as the mother and was also able to demonstrate this to the mother by careful alternation of the imitative response in the communication. Both complementary and opposing play involved the partners, not simply paralleling each other's movements as in matching play, but required that one partner find an appropriate but distinct response to the other's action. In complementary play the infant had to identify what she could do in order to follow and complete the mother's plan, while in opposition she had to choose behaviour that effectively countered the mother's action although the games were played in a framework of mutually consenting dispute. Both these types of play indicated that the infant understood in some way the relation between her own actions and those of the mother and how the infant could use her own actions to change the process of their joint activity.

Playful touching and controlling movements and their complementary or opposing replies all involve physical contact between mother and infant. These may be considered to be a form of teasing about the physical power one person can exert over another or about the intrusions one can make into the other's personal domain. Support is given to this interpretation by the observation that the

infants sometimes became rough when playing and hurt the mother when pulling or pinching her, in their excitement having lost playful control of their actions. The infants accepted teasing intrusions of their body space by their mothers during person play. Such intimacy was not apparent during communication about objects though it appeared with quite a different purpose when the mothers attempted to console a distressed infant. It is noteworthy that the mothers submitted to the infants' control and intrusions even though the infants are far weaker than their mothers and quite incapable of exerting physical power over the mother if she were unwilling to submit. As Winnicott (1971) suggested, it appears that the mother subjects her power to fulfil the infant's wishes and so enhances the potency of the infant's actions.

It appears that imitation too has a significant teasing function in the interactions of mothers and infants. While imitation occurred only rarely in serious communication with objects, it was far more common in playful exchanges. It is possible that imitation is used in unambiguous tutoring situations, but otherwise has a mainly comic or facetious teasing effect of "follow the leader" not appropriate to serious interactions. Certainly repeating what the partner has just said is odd in adult interactions providing the basis for the long-standing joke, "Why do you keep repeating everything I say?"

The infants' directives for the mother to make a particular contribution to person play like those used in communication about objects indicate that the infants have expectations about the

mother's action and understanding of the distinction between the actor and the recipient in communication. However they express a different interpersonal understanding as they are not concerned with another person's manipulation of physical object, but involving body contact and direct interpersonal attention these directives clearly express the distinction between "I" and "you" in creating a joint interpersonal effect. While there were major differences in the forms of communication with toys or without them, it was apparent that similar forms of interpersonal action were used in both serious and playful activity. Notably the infants used and responded appropriately to the direction of attention and actions demonstrating, as predicted by the theory of infant intersubjectivity, that similar communicative and cooperative processes were available both for the joint manipulation of objects and for the direct interpersonal action of person play.

CHAPTER SEVEN: INFANTS' COMMUNICATIVE INITIATIVES

7.1 THEORIES OF COMMUNICATIVE INITIATIVE DURING INFANCY

In explanations of infant social behaviour it is commonly proposed that social interactions between mothers and infants occur because the mothers create and maintain an exchange of expressive actions. When discussing the interaction between two- and three-month-olds with their mothers, Clark and Krige (1979) write that the mother's "response is more than simply appropriate - she deliberately exploits every opportunity that presents itself to establish communication" (p.1). Stern (1974a, 1974b and 1977) also emphasised the importance of the mother in maintaining the young infant's attention and arousal so that he will watch her and coo and smile. He suggested that these infant social behaviours induced the mother to repeat her social actions and so keep the infant's attention and maintain the infant's arousal at an optimum level for social interaction.

Schaffer (1977), discussing the change in communication at the end of the first year, considered that before this change, the mothers and infants engage in "pseudo-dialogues" which depend on the mother replying to the infant's actions as though they were communicative. He suggested that the child achieves the concept of dialogue at about the end of the first year. After this change the infant can take either role in exchanges involving an actor and a spectator, or a giver and a taker, and this, Schaffer proposed, is evidence

that the infant has learned that dialogues are two-sided and that the roles are therefore interchangeable and reciprocal.

The attribution of this achievement at this age apparently contradicts other studies in which Schaffer and his co-workers (Schaffer et al, 1977 and Schaffer and Crook, 1978) have argued that even with infants over one year, infant and mother appear to interact because the mother phases her behaviour to alternate with that of her infant. Schaffer and Crook (1978) do state that "the infant's active role in determining the course and content of social interactions clearly deserves emphasis" (p.66); nevertheless they confine their investigations to the mother's behaviour and do not describe how it relates to that of the infant.

Newson (1975, 1977a and 1977b) has suggested that the infant is frequently involved with another person in "structured interactions" which become familiar to the infant and provide a framework for mutual understanding and shared meanings. In Newson's discussion more thought is given to the infant's contribution than in Schaffer's, but for both these authors the infant is involved in a patterned interaction because the mother gives structure to the succession of their responses. That the infant may have powers to initiate new forms of communicating and to actively direct the course of interaction is not explored.

Trevarthen (1979) in contrast to the above authors, argued that as early as two months of age, infants have developed a complex form of mutual understanding with their mothers. According to this

position, humans can, from early infancy, direct and regulate interactions as well as be directed and regulated by others, though the areas of expression in which communication occurs develops greatly with the psychological growth of the infant. This proposition has been supported by Murray (1980) who found that two to three-month-olds have expectations of the affective quality of the mother's responses and that if these are not fulfilled, the infants show distress and withdrawal. In addition, Sylvester-Bradley (1980) found that at three to four months infants' avoidance of face to face interaction induced the mothers to find new ways of interacting with the infants and so led them to discover game playing. The games that mothers played with them developed out of the infants' changing psychology, not from the imposition of a new activity by the mother.

Trevarthen's theory of infant intersubjectivity makes predictions about the infants' communicative initiatives at the end of the first year.

1. The infants will be able to show autonomy in using the new communicative actions to direct the mother's attention and action when the mother is not attempting to interact with the infant.
2. The infants will initiate bouts of communication with their mothers and this will be markedly more frequent when the mothers are socially restrained.
3. Developmental differences in a general change in communication with other persons at this time will be apparent in all aspects

of the infants' communication. It is expected that the individual infants would show consistency between their tendencies to perform each of the new communicative actions to direct the mother's attention and action in both communication with objects and in person play.

7.2 METHODS

Each of these predictions was examined with different analyses which are here explained in turn.

7.2.1 Communication with a socially restrained mother - In studies of mother-infant interaction, mothers may be anxious to show how well they interact with their infants and so give the infants little opportunity to initiate communication. Also, while the experimental instructions to the mother may give her the single purpose of attending to and communicating with the infant, the infant may often have a number of competing interests, exploring new surroundings and toys, as well as interacting with the mother. These factors may result in the mother leading most of the interaction and the infant may be seen as contributing little to its course.

However, useful information can be gained by inducing the mother to reduce the amount of communication and then observing how the behaviour of the infant changes. Such a procedure can have associated problems since it is not possible for someone to fully control his behaviour in a spontaneous and, in many ways,

unpredictable interaction. Furthermore, artificial modifications of the communicative behaviour can cause uninterpretable reactions because that person may appear strange to the partner, who may then behave uncharacteristically. So it is necessary to find a simple way for the mother to disengage herself or redirect her interpersonal behaviour and alter her behaviour only slightly so that it does not induce odd reactions in the infant.

Bearing these problems in mind, an attempt was made to gather evidence on the relative contributions of mothers and infants to the initiation and progress of interactions by asking the mothers to restrain their social behaviour. The mothers were told, "(infant's name) is going to play on her own. If she is friendly to you, be friendly in return. If she drops a toy, pick it up again, but don't get involved in any games." These instructions were aimed at keeping the mother responsive to the infants' communicative initiatives, yet avoiding initiating communication themselves, and resisting building on and developing the infants' communications. It was hoped that the mothers would not appear strange to the infants, but would remain accessible, responsive and friendly, waiting for their daughters' lead rather than taking the lead as it was expected they would do during the unrestrained conditions.

The behaviour of mothers and infants during this condition was coded using the categories in Appendix A. The behaviours were analysed to establish whether the mothers had managed to be responsive and yet avoid leading in communication. To do this the mothers' behaviour during the restrained condition was compared with that in

the other conditions when they participated freely. Then the infants' behaviour was examined to establish whether the age-related changes in use of actions to direct the mothers' attention to objects (categories 22, 26, 27 and 31-35) and action on objects (directives) observed during the unrestrained conditions, also occurred when the mothers were socially restrained.

7.2.2 Initiation of communication - The behaviour of mothers and infants on the video recordings showed that at times the partners were sharing an interest, jointly engaged in an activity or playing together. There were also periods when one was engaged in solitary activity while the other watched or both were pursuing their own activity at the same time. For this investigation into initiatives in communication, it was important to identify the episodes of joint attention, action and play, which were termed "communication sequences", and establish by whom and in which way they were initiated and terminated.

A communication sequence was defined as an uninterrupted series of communicative actions to which both mother and infant contributed, and was started when one person performed a communicative action that was responded to by the partner, so creating mutual attention or a shared focus for interest and action. A communication sequence ended when one or both partners became involved in a solitary interest. Each communication sequence consisted of at least two turns, one person's initiation and the other's reply. A turn could be made up of several communicative actions provided the partner maintained interest in the other's activity. One person performing

a series of communicative actions while the other only watched did not constitute a communication sequence. Both had to become involved in performing actions as defined in the listed communication categories. When the mothers and infants centred their communication on a toy, the infant's gaze was a good indicator of interest. However, when playing without toys, gaze was not always so helpful. For example, there were times when an infant was looking around the room and the mother touched the infant or made a playful sound and the infant replied by smiling, touching or even imitating without directing her gaze to the mother or her activity. In such situations the infant's smile, touch or vocalisation was considered a communicative action within a communicative sequence.

The communicative sequences and constituent turns identified were marked on the transcripts (see Appendix C). For each mother-infant pair in all four conditions of each recording session, the number of communication sequences was established and their duration was measured both in number of turns and in duration of time. In addition the beginning and end of each communication sequence were examined to identify which partner started and terminated it and how these were done. All the above measures were made separately for each age of the infants and results for the condition with the restrained mother were compared with those in which the mothers were fully involved in the interaction.

7.2.3 Correlations in the subjects' communicative action - For each mother and each infant in all recording sessions the frequency was found for directives in both communication about objects and in

person play. Also the number of times each subject performed actions to direct the partner's attention to an object (categories 22-24 and 26-35) and displays in person play (categories 52, 53 and 55-59) was established. Using Spearman's rank correlation coefficient the degree of correspondence was calculated between the mothers' and infants' tendencies to use each of these communicative actions. This was done to discover whether the preferences in performing the communicative actions by members of the same subject pair were related to each other in a simple imitative or complementary manner. The correspondence in the individual infants' tendencies to use these four types of communicative action was calculated using Kendall's coefficient of concordance¹. Similar examination was made of the mothers' communicative actions using both statistical tests.

7.3 RESULTS

7.3.1 Communication with a socially restrained mother - In response to the request to be responsive, but avoid initiating or maintaining communication, the mothers showed a number of modifications in their behaviour. Each mother performed fewer communicative

¹ While Spearman's rank correlation coefficient (r) is a measure of association between two variables, Kendall's coefficient of concordance (W) may be used to measure the relation among several rankings of variables in a group of subjects (Siegel, 1956).

actions than did her daughter while the reverse occurred in the other conditions. There were no instances of the mother touching the baby and they talked very little in this condition. One mother made only one utterance in all the recordings of this condition.

In sixty two percent of communication sequences the only communicative actions the mothers performed were ones of greeting in response to the infant's initiative, involving various combinations of smiling, laughing, looking at the infant's face, nodding and raising the eyebrows. The mothers made other contributions to the communication, but compared with the conditions in which they were fully active partners, the mothers made very few spontaneous communicative actions with objects or personal displays (Table 7.1). They made some actions to manage the infants' activity by controlling the infants' attempts to push toys off the table or by attracting the infants' attention back to the toys on the table. These were made to distract the infants from attending to the mother herself or trying to interest her in the toys on the cupboard. In the unrestrained conditions the mothers generally did not try to avoid these types of infant communication, often responding to the infants' interpersonal attention with smiles, vocalisations and personal display, and pointing and talking about the infants' interest elsewhere in the room.

The mothers of three infants, Vanessa, Laragh and Ann, made a few responses to infant communications directed to themselves, complying with *directives*, reacting to provocation or accepting

TABLE 7.1 COMPARISON OF MOTHERS' COMMUNICATIVE ACTIONS WHEN RESTRAINED
AND WHEN FULLY PARTICIPATING IN COMMUNICATION. RESULTS FOR
FIVE SUBJECTS IN ALL SESSIONS COMBINED

Mother's communicative action	Frequency when restrained	Mean frequency for three conditions when fully participating
Smiles and laughs	97	392
Complies with directives	5	6
Responds to provocation	15	4
Accepts offered object	1	2
Takes up I's interest in object	4	208
Controls I's action on object	12	83
Indicates object to distract I	5)	565
Spontaneous action to indicate object	20)	
	25)	
Gives directives for I's action on object	1	162
Responsive displays to I's greeting	24)	278
Spontaneous face and voice displays	15)	
	39)	

an offered object. The frequencies of these communicative actions of the mothers were similar to their mean frequencies in the other conditions indicating that the infants were inducing their mothers to respond to them despite the mothers' attempts to be socially restrained. As the frequencies of these responsive actions were low, it was not possible to detect a clear change as the infants grew older. However all the mothers' responses to *directives*, provocation and offering a toy occurred in the last three sessions.

When the mother was restrained, four infants (all except Eliza) showed an increase with age in the frequency of communicative actions of personal attention and emotional expression. They also showed an increase with age both in the frequency and percentage of communicative actions with objects, but infant actions of person play were rare at all ages (Figure 7.1). With the mother socially restrained, each of the infants performed more actions to attract the mother's attention to a toy than in the teaching condition, and four infants (all except Alison) used more than in the condition play with a toy.

Three infants, Laragh, Vanessa and Ann, together gave twelve directives for actions on objects during the last two sessions (Table 7.2), while in the two object-handling conditions with a fully participating mother, three infants gave eleven directives to the mothers. Half of the infant directives to the socially restrained mothers were for actions new to the recording session while the rest (all performed by Laragh at fifty four weeks) were attempts to get the mother to repeat an action performed during the

Figure 7.1 Percentages of different classes of infants' communicative actions with a socially restrained mother by age of infants. Results for all infants combined.

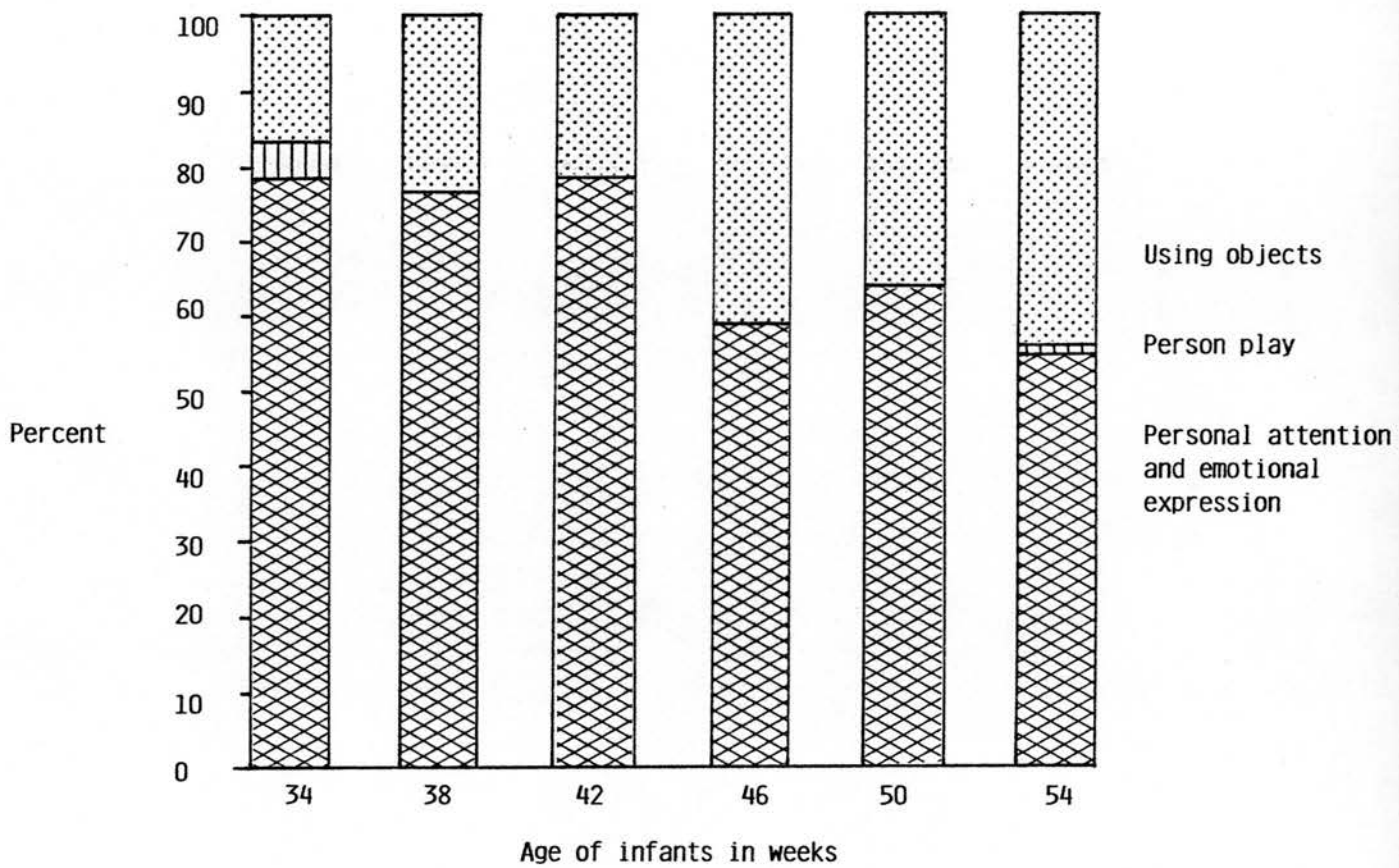


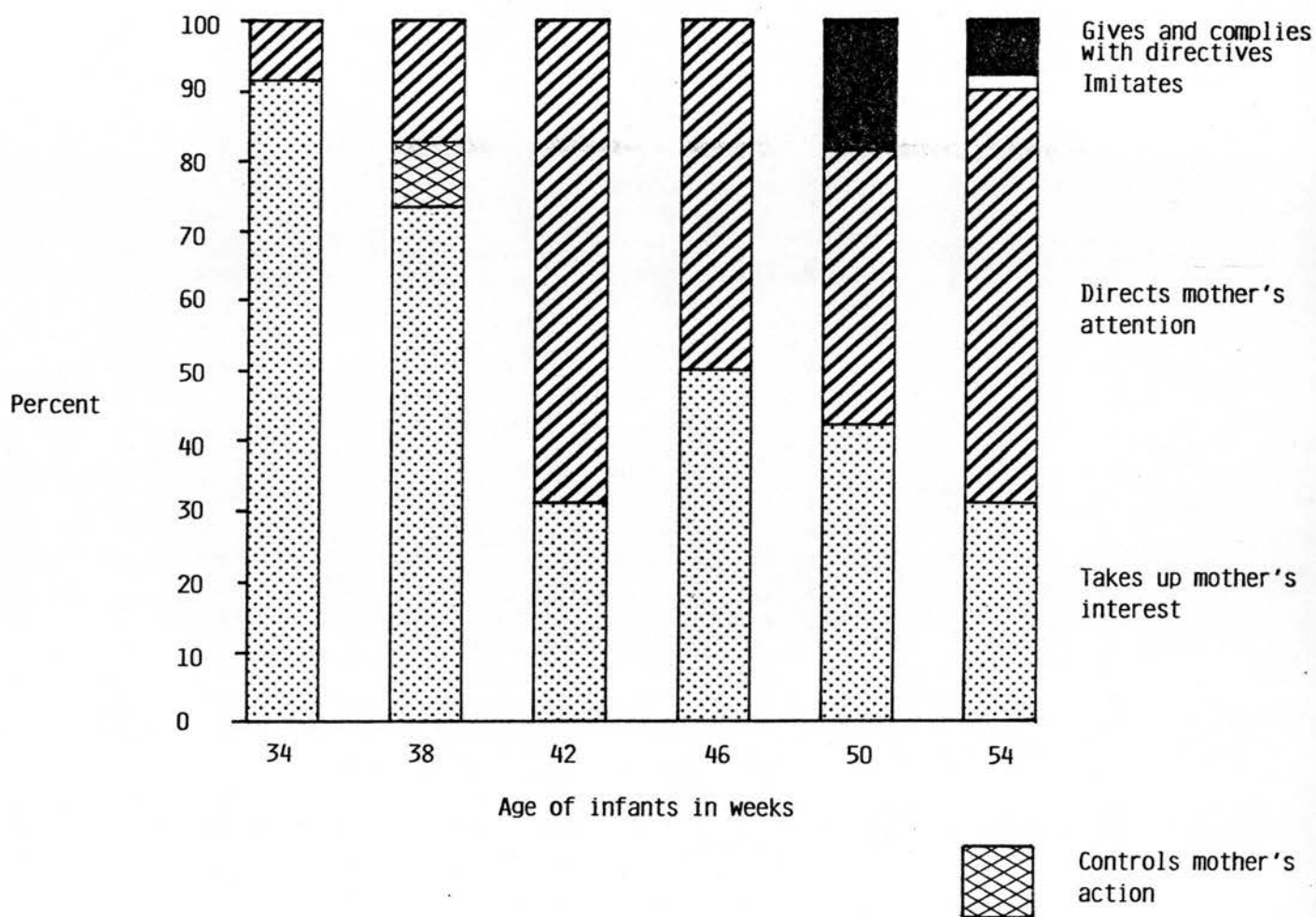
TABLE 7.2 INFANTS' DIRECTIVES, THEIR RELATION TO CONTEXT OF JOINT ACTION AND ROLES SPECIFIED

Infants' directives	Tries to get mother to:	By specifying:	Subjects and age	Frequencies
Indicates mother's praxic action	a. perform action new to session	other as agent and object to be used	Ann 50 wk. Laragh 50 wk.	1 1
	b. assist infant's action which is new to session	other as agent and object to be used	Vanessa 50 wk.	4
	c. repeat action performed in immediately preceding condition	other as agent and object to be used	Laragh 54 wk.	6

recording of the immediately preceding session forty five seconds earlier. The directives given by Ann and by Laragh were for the mother to retrieve an object which the infant had thrown on the floor. Vanessa's directives were attempts to induce the mother to release the ball from the rattle. This was the first time she had handled this toy during the recording session and she was manipulating it assembled, not in pieces. In giving the directive, the infant was apparently remembering the separation of the parts that had been done for her in the preceding session four weeks earlier. The infant showed persistence, making four requests for assistance, but none was complied with by the mother. Later, commenting on the events, the mother said that she realised what the infant was asking her to do and she wanted to help, but had not done so because of the researcher's instructions.

Not surprisingly the infants did not "resist" or "accept" the mother's action or follow her attention since there were virtually no actions to respond to. Likewise, actions controlling and imitating the mother were very rare. Despite the low level of activity from the mothers the infants made many actions taking up the mother's interest (Group 1 of communicative actions with objects). The majority of these were in response to the mother placing on the table a toy she had retrieved from the floor. As the infants grew older the group results indicate that they used a smaller proportion of actions taking up the mother's interest and showed a concomitant rise in actions directing the mother's attention (Figure 7.2). This change with age was also reported

Figure 7.2 Percentages of infants' communicative actions using objects with a socially restrained mother by age of infants. Results for all infants combined.



above for the conditions of teaching and play with a toy. However, in this condition, the results are not statistically significant because two infants, Alison and Ann, did not show this change in behaviour reflecting their mothers' communicative restraint.

7.3.2 Initiation of communication - In all conditions in which the mothers were active partners, most of the communication was initiated by them, and the actions they used to do this varied according to the instruction given and the availability of toys. In play without toys the most frequent ways that mothers initiated communication were by touching the baby or making a hand or body display (Table 7.3). Although no toys were given to the subjects, much communication was started by establishing a joint interest in objects. Overall, thirteen percent of the communication sequences were started in this way. Infants and mothers together manipulated the mirror, plastic table edging, belly band and tissues and shared interest in the lights, posters and the toys on the cupboard.

When playing with toys and teaching, the mothers most frequently initiated communication by establishing joint action or interest with reference to objects. They initiated very few communication sequences by touching their daughters (Tables 7.4 and 7.5). In teaching, each of the mothers initiated communication by attracting the infant's attention to their own activities more frequently than by taking up the infant's interests. While in play with a toy the reverse occurred, with four of the mothers taking up the infants' solitary interests more frequently than attracting the infants to

TABLE 7.3 TEMPORAL PATTERNING, INITIATION AND TERMINATION OF COMMUNICATION SEQUENCES IN CONDITION PLAY WITHOUT TOYS

Age of infants in weeks	Duration of communication as % recording time	Mean number of communication sequences	Mean number of turns per communication sequence	% Communication initiated by mother						% Communication initiated by infant				% Communication terminated by:	
				Attracts infant to own interest in object	Takes up infant's interest in object	Controls infant's activity on object	Personal attention and emotional expression	Touches or acts on infant	Own hand or body display	Attracts mother to own interest in object	Personal attention and emotional expression	Touches or acts on mother	Own hand or body display	Infant's solitary activity	Infant looks away
34	48	14.6	4.0	0	6	4	12	53	19	0	6	0	0	28	72
38	53	14.6	4.5	1	4	7	14	26	26	0	19	4	0	25	75
42	60	12.8	5.8	2	13	2	8	21	44	0	8	2	2	41	59
46	56	14.6	4.8	3	3	8	17	36	28	0	6	0	0	23	77
50	64	14.8	5.1	0	1	14	11	20	42	1	11	0	0	44	56
54	75	13.6	5.8	2	2	4	13	28	32	6	12	0	0	45	55

TABLE 7.4 TEMPORAL PATTERNING, INITIATION AND TERMINATION OF COMMUNICATION SEQUENCES IN CONDITION PLAYING WITH TOYS

Age of infants in weeks	Duration of communication as % recording time	Mean number of communication sequences	Mean number of turns per communication sequence	% Communication initiated by mother					% Communication initiated by infant			% Communication terminated by:		
				Attracts infant to own interest in object	Takes up infant's interest in object	Controls infant's activity	Personal attention and emotional expression	Touches or acts on infant	Attracts mother to own interest in object	Takes up mother's interest in object	Personal attention and emotional expression	Mother's solitary activity	Infant's solitary activity	Infant looks away
34	46	11.2	4.6	30	32	23	2	2	4	4	4	0	53	47
38	60	13.6	4.5	50	32	9	4	0	2	0	3	9	65	26
42	48	13.2	5.1	31	34	17	9	2	0	0	5	6	65	29
46	48	13.4	3.7	28	29	25	6	2	5	0	6	0	78	22
50	54	14.4	4.0	22	40	18	6	0	4	1	10	1	57	42
54	59	15.0	4.4	25	35	16	7	5	9	1	1	4	79	17

TABLE 7.5 TEMPORAL PATTERNING, INITIATION AND TERMINATION OF COMMUNICATION SEQUENCES IN TEACHING CONDITION

Age of infants in weeks	Duration of communication as % recording time	Mean number of communication sequences	Mean number of turns per communication sequence	% Communication initiated by mother					% Communication initiated by infant			% Communication terminated by:		
				Attracts infant to own interest in object	Takes up infant's interest in object	Controls infant's activity on object	Personal attention and emotional expression	Touches or acts on infant	Attracts mother to own interest in object	Takes up mother's interest in object	Personal attention and emotional expression	Mother's solitary activity	Infant's solitary activity	Infant looks away
34	43	15.6	3.7	46	22	16	1	0	0	3	12	0	61	39
38	43	14.4	3.3	57	13	13	6	0	0	1	10	2	80	18
42	44	15.2	3.4	65	14	11	0	0	0	0	11	1	67	32
46	41	12.8	3.6	37	19	15	0	0	8	8	16	2	76	23
50	48	15.2	3.6	45	26	11	1	1	1	3	12	1	76	23
54	58	10.2	6.3	31	22	24	1	3	6	0	12	0	68	32

their own. The exception, Vanessa's mother, showed a strong tendency throughout to lead in communication and control her infant's movements and was apparently resistant to following the infant's interests.

When they were following instructions to be socially restrained the mothers initiated few communication sequences, nineteen percent as against eighty seven percent when free to take an active part (Table 7.6). They most frequently did this by attracting the infant's attention to their own actions and by smiles or looks at the infant.

The overall results show that the babies initiated thirteen percent of the communication sequences when the instructions allowed the mothers to be fully engaged. There was no change with age in the likelihood of infants initiating communication, though there was a change in the way they did this. In the teaching condition all the infants initiated communication sequences by attracting the mother to their own interest more frequently in the second half of the study than in the first. For the other conditions the group results show similar trends, but the individual subjects did not all consistently change their behaviour in this way. Overall, the most common way for each of the infants to initiate communication was with actions of personal attention and emotional expression, usually a look at the mother's face combined with a smile or laugh.

When the mothers were socially restrained, all the infants initiated communication more frequently than in any of the conditions in which

TABLE 7.6 TEMPORAL PATTERNING, INITIATION AND TERMINATION OF COMMUNICATION WHEN MOTHER SOCIALLY RESTRAINED

Age of infants in weeks	Duration of communication as % recording time	Mean number of communication sequences	Mean number of turns per communication sequence	% Communication initiated by mother				% Communication initiated by infant			% Communication terminated by:			
				Attracts infant to own interest in object	Takes up infant's interest in object	Controls infant's activity on object	Personal attention and emotional expression	Attracts mother to own interest in object	Takes up mother's interest in object	Personal attention and emotional expression	Mother's solitary activity	Mother looks away	Infant's solitary activity	Infant looks away
34	9	4.4	3.1	5	0	9	9	0	5	73	0	5	71	24
38	6	4.6	2.2	9	4	4	4	4	4	70	13	0	61	26
42	6	4.8	2.2	0	0	0	4	35	0	60	5	9	59	27
46	9	5.2	2.5	8	4	0	8	15	0	65	0	0	65	35
50	13	7.2	2.5	11	0	8	6	25	3	47	14	3	54	29
54	21	5.8	4.1	10	3	3	4	38	7	35	25	4	57	14

the mothers' communicative behaviour was unrestrained (Sign Test, $p < .05$, Figure 7.3). One infant, Vanessa, in every session, initiated communication more frequently in the condition with the restrained mother than in all other conditions combined. Four of the infants, all except Eliza, initiated communication more frequently in the first three than the last three sessions when the mother was socially restrained. For these same four subjects, the actions used to initiate communication showed similar changes with age. They used communicative actions with objects more frequently and those of personal attention and emotional expression less frequently as they grew older.

In two conditions, play without toys and when the mother was socially restrained, all the subject pairs communicated longer in the last three than the first three sessions. This change was not apparent in the other conditions. When the mother was socially restrained communication was shorter than in the other conditions, accounting for eleven percent of the condition time compared with a mean of fifty three percent. The communication sequences were also shorter than with a fully participating mother. Most of the subject pairs in each of the sessions engaged in communication sequences with mean lengths ranging from the shortest possible of 2.0 turns to 3.8 turns. The sole exception to this was Laragh and her mother in their final session when the communication sequences lasted for a mean of 7.7 turns. The communication in this session was largely driven by the infant's persistent use of provocations and directives and took up half of the condition time. The same infant at fifty weeks and Vanessa at fifty four weeks, engaged in

Figure 7.3 Comparison of the number of communication sequences initiated by infants in condition with socially restrained mother and other three conditions.

Play with toys

	34	38	42	46	50	54	Age of infants in weeks
Alison							
Ann							
Eliza							
Laragh							
Vanessa							

Teaching

	34	38	42	46	50	54	
Alison							
Ann							
Eliza							
Laragh							
Vanessa							

Play without toys

	34	38	42	46	50	54	
Alison							
Ann							
Eliza							
Laragh							
Vanessa							



Infant initiates more communication sequences with restrained mother

Infant initiates fewer communication sequences with restrained mother

Infant initiates same number of communication sequences in both conditions

communication with their restrained mothers for twenty five percent of the possible time and they used similar techniques of provocation and directives to maintain the interaction.

In all conditions, most communication ended when the infants looked away or became involved in solitary activity. The mothers terminated very few communication sequences when they were fully participating (one percent). However, when they were socially restrained, they ended thirteen percent of the communication sequences.

7.3.3 Correlations in the subjects' communicative action - The results show a significant degree of consistency within the individual infant's tendency to perform actions to direct the mother's attention and action in both communication with objects and in person play (Table 7.7 and Figure 7.4). The mothers showed a significant positive correlation between actions to direct the infant's attention and action during communication about objects, but their tendency to use these actions was not related to directives and displays in person play. The correlations between the infants' and mothers' attempts to direct each other's attention or action showed no significant results.

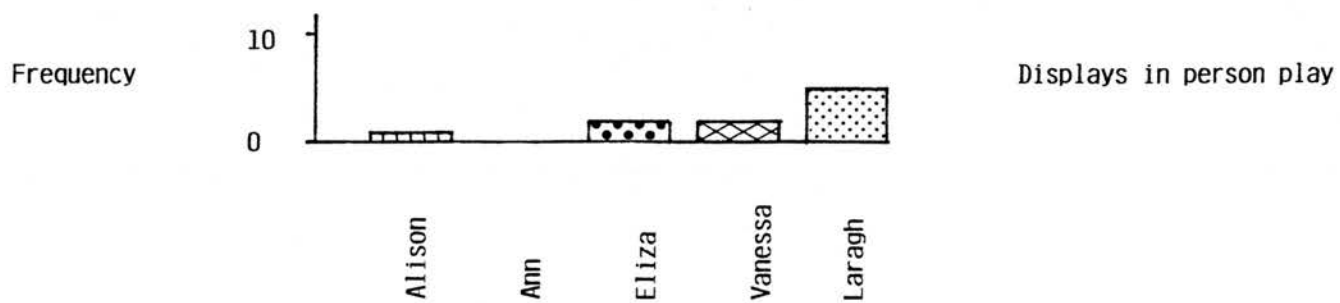
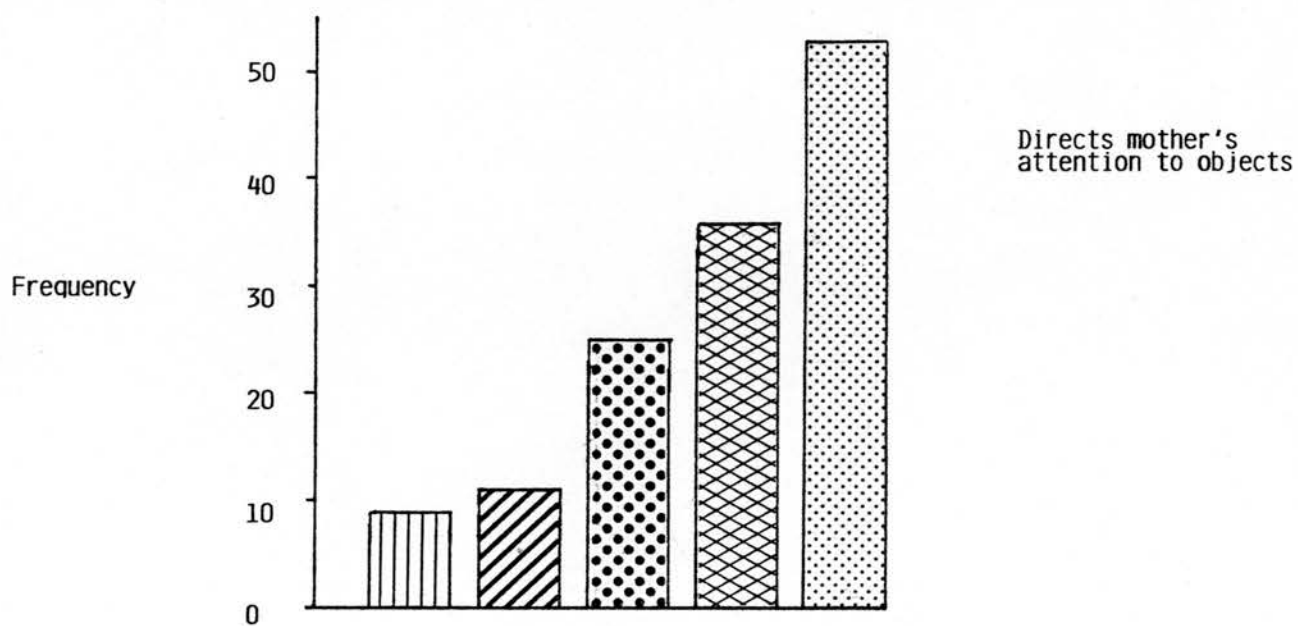
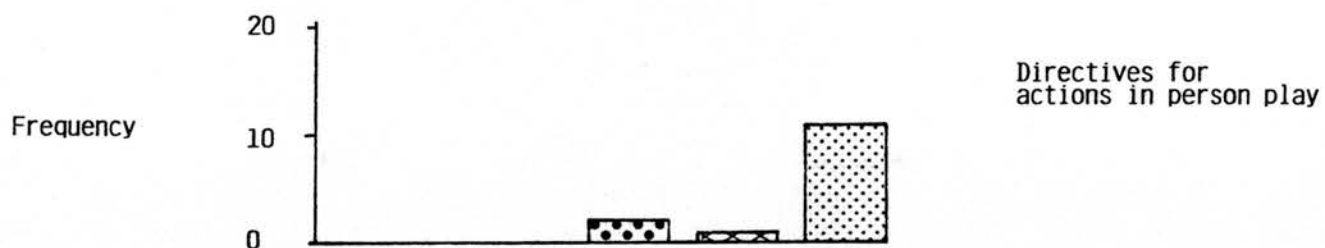
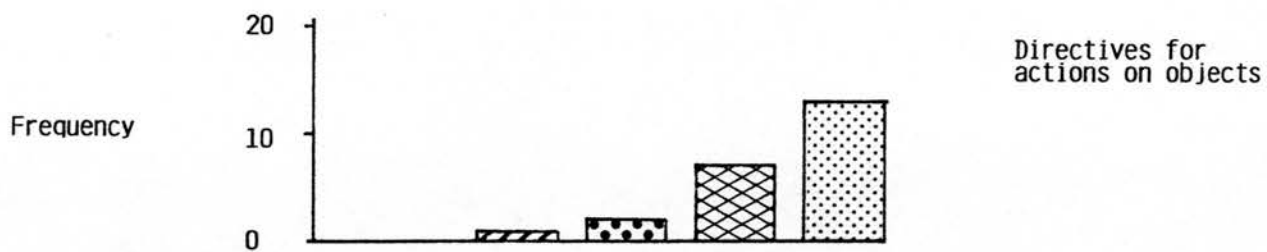
7.4 DISCUSSION

The results show that the mothers were largely successful in restraining their interactive behaviour as instructed by the

TABLE 7.7 CORRELATIONS IN COMMUNICATIVE ACTIONS TO DIRECT PARTNER'S ACTION
AND ATTENTION

Communicative actions	Kendall's coefficient of concordance (W) or Spearman's rank correlation coefficient (r)
A. <u>Within infants' behaviour</u>	
1. Gives directives for action on objects Gives directives in person play Directs M's attention to object Performs hand or face display	W = 0.84 p < .01 *
B. <u>Within mothers' behaviour</u>	
1. Gives directives for action on objects Gives directives in person play Directs I's attention to object Performs hand or face display	W = 0.36 N.S.
2. Gives directives for action on objects Directs I's attention to object	r = 0.9 p = .05 *
3. Gives directives in person play Performs hand or face display	r = -0.1 N.S.
C. <u>Between infants' and mothers' behaviours</u>	
1. Gives directives for action on objects	r = 0.5 N.S.
2. Gives directives in person play	r = 0.58 N.S.
3. Directs partner's attention to object	r = 0.5 N.S.
4. Performs hand or face displays	r = -0.63 N.S.

Figure 7.4 Consistency in individual infants' attempts to direct the actions and attention of the mothers in communication using objects and in person play. Results for all ages and all conditions combined.



experimenter. Apart from some differences in response to the mothers' changed communication, the infants performed a similar range of communicative actions with objects as in the other object-using conditions and these showed similar changes in frequency as the infants grew older. The restrained manner of the mothers induced the infants to be more forceful in efforts to communicate by using displays and directives more frequently than they did in the other conditions. Half of the directives given to the mothers were independent of any immediately preceding joint action. Thus while the infants were capable of adapting to a context of joint action when formulating directives for their mothers, they were also able to generate ideas for communication based on recollection of more distant experiences. These results show that the infants continued to employ spontaneously the knowledge of agency and mutual understanding that they used in conditions where the mother was free to give active support.

In response to the restrained mother, all the infants initiated more communication sequences than in the other conditions demonstrating that they were capable of actively promoting communication themselves. Both the communication sequences and the amount of time spent in communication were shorter than in the other conditions, so it appears that the full engagement of the mother was necessary for maintaining communication at its normal level. However, even adults find it difficult to maintain conversations with a shy or reticent partner.

The finding that the temporal patterning of interactions remained largely unchanged throughout the duration of the study at all ages and in all conditions is important. It appears that there was a basic interaction framework already established in the earliest session and this in fundamental ways is similar to that described by Sacks et al (1974), for interactions between adults having distinct procedures for opening and closing and consisting of alternating turns. Although the way that communication was started and terminated clearly reflected the constraints imposed by the experimental conditions, the fundamental cooperative format of interaction in terms of the lengths and frequencies of turn-taking sequences and the balance of initiative between the partners in starting and terminating contact was unchanged. The infants' new communicative abilities were expressed in this fundamental interaction framework. The existence of such a framework possibly facilitates the acquisition of new forms of communication providing a familiar and well-practised format of communicative initiatives and responses in the alternating action of the communicators that may help with recognition of each others' intentions.

In order to communicate, the infants did not require that the mothers adhere rigidly to a particular pattern of interaction. They readily adapted to the changing conditions initiating more communication with the socially restrained mothers. It appears that most of the infants were becoming more adept at this as they grew older, increasing the number of communicative initiatives. This and the evidence that right at the end of the study two infants were

starting to prolong communication by using directives and provocations, suggest that there may be a change in the balance of initiative between the infants and mothers towards the end of the first year.

The high level of consistency in the individual infant's use of the new communications to direct the partner's action and attention in both communication with objects and in person play, supports the proposal made by the theory of infant intersubjectivity that these are all expressions of a general change in the infants' understanding of communication with other people at this time. The infants' performance of these communicative actions was not related in any simple imitative or complementary way to the mothers' preferences in using similar actions. This indicated that the infants may have had an independent approach to the interaction that reflected developmental differences or possibly personality variables (e.g. a tendency to lead in interaction) or both.

Evidently the mothers found it difficult or unnatural always to wait for the infants to communicate with them, initiating almost one-fifth of the communication when they were socially restrained and dominating communication when they could participate fully.

However, the infants did not need the mothers to structure the interactions as proposed by Schaffer, Newson and other psychologists. The infants themselves were able to initiate communication, employing their new communicative abilities and, at times, pushing the mother to enter into interactions despite her attempts at restraint, thus supporting the theory of an innate motivation for communication

(intersubjectivity). This does not mean that the infants never require the mothers to lead in interaction. There are times in their development when their contribution to communication is largely responsive rather than initiatory and it appears that the mothers could be regulated by the infants' responsiveness to use particular forms of interaction (Murray, 1980; Sylvester-Bradley, 1980 and Chapter Five above). It appears that this is a two-way communication in which the partners can show different levels of relative assertiveness and the infants' abilities to direct communication change with developments in their understanding of other people and themselves.

CHAPTER EIGHT: INTERPERSONAL GAZE, SMILES AND LAUGHTER OF INFANTS
DURING COMMUNICATION

Eye contact, smiling and laughter are important in the control of human interactions both for infants (Jaffe et al, 1973; Murray, 1980; Stern, 1974a, 1974b and 1977) and for adults (Argyle and Cook, 1976; Darwin, 1872; Ekman, 1973). In this chapter an investigation of the infants' visual orientations towards the mother's face and of smiles and laughter is presented in an attempt to establish the quality of interpersonal contact accompanying the different forms of communication examined in the previous chapters.

8.1 FUNCTIONS OF INTERPERSONAL GAZE IN COMMUNICATION DURING
INFANCY

In the first few weeks of life an infant may fixate on a face and follow its displacements, but visual orientation is relatively erratic and unfocused at this time (Braddick and Atkinson, 1979; Dobson and Teller, 1978, and Held, 1979). Nevertheless visual orientation has meaning for the mother. Macfarlane (1977) found that mothers did not feel they had met their newborn babies until the baby had opened his eyes. Wolff (1963) observed that from three and a half weeks infants directed their eyes to the upper face seeking eye contact. He noted that this selective orientation had a marked effect on the mothers who from this moment felt they could

play with their infants and spent more time doing so. In their play the mothers make a wide variety of movements and noises to attract the infant's visual attention (Fogel, 1977; Stern, 1977) and once eye contact is established infants have been found to use it effectively to make and break interactions with the mother (Jaffe et al, 1973). On the other hand, unresponsive or inappropriate expressive behaviour by the mother in the course of friendly engagements with her infant causes two month olds to show distress and gaze aversion (Murray, 1980). Refusal on the part of the infant to maintain eye-contact when the mother is seeking communication becomes more frequent from three months of age and this leads the mother to make extra efforts to attract the infant's attention by presenting objects and playing games which excite the baby (Trevvarthen and Hubley, 1978; Sylvester-Bradley, 1980; Trevvarthen, 1983).

These findings all show that changes in the young infant's interpersonal gaze are important in regulating communication with the mother, and further studies suggest that new forms of patterning of interpersonal gaze demonstrate important developments in the infant's communication at the end of the first year. Trevvarthen and Hubley (1978) noted that at 45 weeks one infant frequently looked at the mother in response to an instruction or to solicit assistance, as well as looking and smiling at her readily during joint activity with objects, often interrupting her own activity to greet the mother in this way. Compared with the behaviour of the same infant at twenty five weeks, the nine to ten month old showed a marked increase in interpersonal attention particularly when either mother or infant was communicating an idea for the

other's action. Bruner (1976) too, noted that when sharing a task with reciprocal roles, infants at the end of the first year frequently use eye contact to check with the partner. In a study of giving and taking objects, Bruner (1975) suggested that the infant's gaze could be used to differentiate between two distinct types of infant communication, that either treated the other as the recipient of an action or perceived her as an agent. In the former the infant looked at the mother's hand in the act of receiving as the infant spontaneously placed an object there, while in the latter the baby looked at her eyes or face as he offered her the object. Bates (1976) also used infant's gaze to infer that the infant at the end of the first year was trying to involve the adult as an agent in his own intentional action. In the same study she considered that the infant turned to look at the adult's face when pointing to an object in confirmation that the adult was attending to that object. The act of turning to look at the adult in this way was considered important in distinguishing between "pointing for self" and "pointing for others". So it appears that at the end of the first year infants may be using direction of gaze in a new way to show that their action is directed to the mother and to check that the mother is attending, i.e. they are both addressing their actions to the mother and monitoring her response by means of orientations of gaze.

The communicative changes described in Chapter Five show developments in the infants' understanding of human action and attention in communication and in the ability to join with another person in a shared task. It could be expected that infants would be more likely to address or monitor, with looks at the mother's face, their

new communicative actions (directing the mother's attention and action and complying with directives) rather than the already well-established actions (taking up the mother's interest in an object or controlling, resisting or accepting) which do not make specific requirements of the mother's agency. The studies by Bruner, Bates and Trevarthen and Hubley cited above observed the infants' gaze during communication with objects. In the present study, communication in direct interpersonal engagement not mediated by objects was also examined. It was suggested in Chapter Six that the infants' communication with objects and in person play was going through equivalent changes at the end of the first year. It could be expected, therefore, that the infants' interpersonal attention would also show parallel changes with their new and increasing communicative play forms (displays, matching, complementing and opposing) frequently involving looks at the mother's face as the infants address their actions to the mother and watch for a response. The already established infant play behaviours of touching the mother, controlling her movement and touching her hand while she performed a play action, are not based on the mutual regulation of action and attention through communication of ideas for play. They involved the infant making direct physical contact in playful assertion and are not transmitted across interpersonal space, nor are they completed by a particular response which the infant has to anticipate. So it might be expected that these earlier infant play forms would usually be performed without a look at the mother's face. The occurrence of looks at the mother's face during communication with objects and in person play was examined to test these propositions.

8.2 FUNCTIONS OF SMILES AND LAUGHTER IN COMMUNICATION DURING INFANCY

It has been suggested that infant smiling and laughter in communication are indicative of playfulness and humour (Sroufe and Wunsch, 1972). These authors related their findings to Piaget's identification of smiles of mastery which infants show when successful in handling physical objects. That is, Sroufe and Wunsch considered these signs of positive affect to be expressions of an intellectual or cognitive achievement. However, as has been pointed out above, this interpretation ignores the interpersonal character of the play that Sroufe and Wunsch were investigating. While smiling in solitary activity occurs, it is usually interpreted by psychologists as a social behaviour (Schaffer, 1971). Infant smiling and laughter has been taken as an expression of affiliation both by Washburn (1929), who found that young infants showed considerably more positive affect with their mothers than with strange adults, and by Bowlby (1969) who identified it as one of the infant's attachment behaviours.

Taking smiles and laughter to be, as Washburn (1929) suggested, indicators of social pleasure, then it may be that as the infant's understanding of personal action and communication increases he would use these signs of positive affect to signal recognition of an interpersonally significant event or to mark it. The infants may selectively smile or laugh when they perform one of the newly acquired communicative actions to direct the mother's attention or action in handling objects or to change the course of person play by making a display or matching, opposing or complementing the

mother's action. They may use smiles and laughs in a similar way to looks at the mother's face to demonstrate the interpersonal value of their communication and its relationship to the partner's agency. This proposition was examined by the analysis given below.

At this point it should be noted that the relation between smiles and laughs in human interaction still needs clarification. Van Hoof (1972) has distinguished in monkeys and apes a staring open mouth display and a relaxed open mouth which indicate, respectively, submission or non-hostility and playfulness. These he relates to human smiling and laughter. Van Hoof suggested that while smiling and laughter have different phylogenetic origins, their functions have converged and they now overlap to a considerable extent. According to this view, a smile may be a gentle laugh, while a laugh may be an intense smile, both serving as signals of affection and playfulness. However, it has also been suggested by McGhee (1979) that laughter has a particular function in response to the comic or facetious indicating that it is more aggressive than smiling. These interpretations of the functions of smiles and laughter raise important issues about these expressions in relation to the infants' communicative actions. Are laughs and smiles used interchangeably in all communicative situations, or are laughs used preferentially when one partner is assertive in creating playful displays, teasing or directing the shared action? This question, also, will be addressed in the following analysis of communication.

8.3 METHOD

Each time an infant looked at the mother's face was noted, as was the communicative context of this sign of interpersonal attention. Identifying the communicative context involved making a judgement about whether the infant's look was spontaneous or in response to the mother's behaviour and noting the infant's action accompanying the look, or the mother's action to which it was a response. These judgements were usually straightforward, though on a few occasions it was not possible to differentiate with whose action the look was linked. In these cases the gaze was considered to be part of joint action and both the mother's behaviour and the infant's behaviour were scored. Thus each orientation to the mother's face was linked to an action of the mother, the infant or both partners. This was done for each infant in every condition and in all sessions.

A similar analysis was made for each infant smile and laugh in all the conditions in every recording session. So, every expression of positive affect made by the infants was linked to some action of the mother or infant or both.

The data was examined to establish whether there were any preferences for looking at the mother's face or smiling and laughing when the infants performed the new communicative actions of directing the mother's action or attention in communication with objects and performing displays, matching, complementing and opposing in person play. In addition, the communicative contexts of infant smiling and

laughter were compared to identify any differences there may be in the use of these expressions by the infants.

It has been stated in Chapter Three that in categorising the infants' communicative action, infant gaze was used along with other information. Also the smiles and laughs of mothers and infants were used to identify episodes of social play. However, it should be noted that no communicative category used in this study required, by definition, that the infant look at the mother's face or smile or laugh. The main criteria for identifying any communication were the form of the movement and the communicative context as defined by the preceding communication and the evoked response. Therefore, while infant gaze and positive affect may have helped at times to confirm an allocation of a category label, these interpersonal signals did not determine the categorisation.

8.4 RESULTS

As they grew older, three infants looked at the mother's face more frequently, while one (Eliza) did so less frequently, and the fifth (Ann) showed no change. So overall there was no clear relation between infant age and frequency of looking at the mother's face. Since the frequency of infant laughter was fairly low, the main results will combine data on infant smiles and laughter and results showing comparisons between these forms of expression will be given later. In the last three sessions, four of the infants smiled and

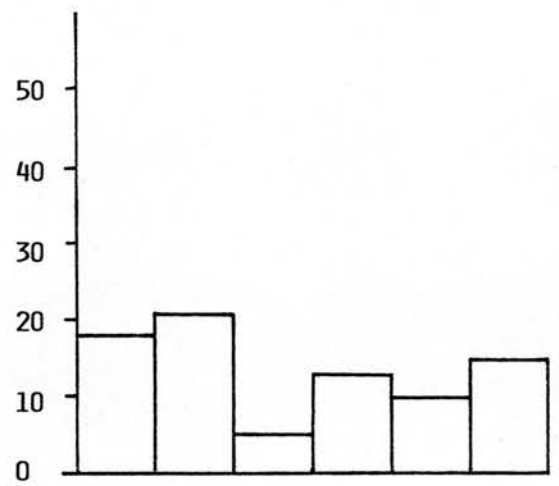
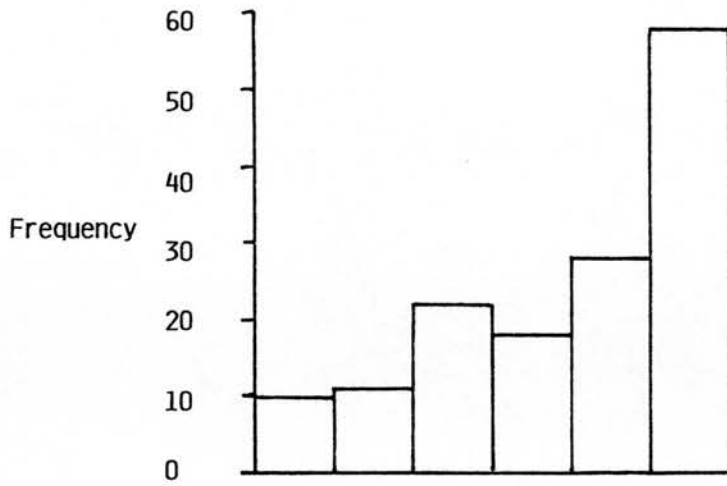
laughed more than in the earlier ones, while the exception, Eliza, smiled and laughed slightly less frequently.

8.4.1 Communicative context of infant interpersonal gaze and positive affect - All the infants frequently looked at their mothers when the mothers performed person play actions and in response to the mothers' personal attention and expressions of emotion. These accounted for twenty one percent and nineteen percent respectively of all the infants' looks to the mothers. (Figure 8.1) They also showed a marked tendency to monitor the mother spontaneously. Nineteen percent of the infants' looks at the mother's face involved them directing their gaze from their own solitary activity even though the mother had done nothing to attract their attention. As they grew older all the infants looked at the mother's face more frequently while making communicative actions about objects. They showed no other clear change with age in the incidence of looking at the mother with their own communications or in response to any communication of the mothers.

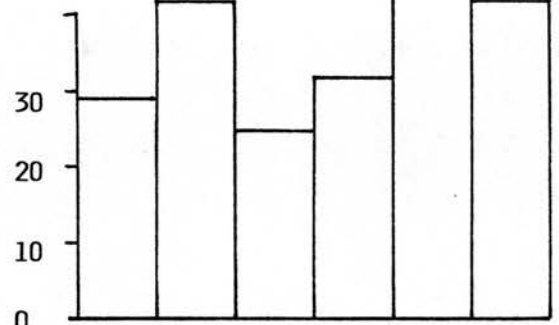
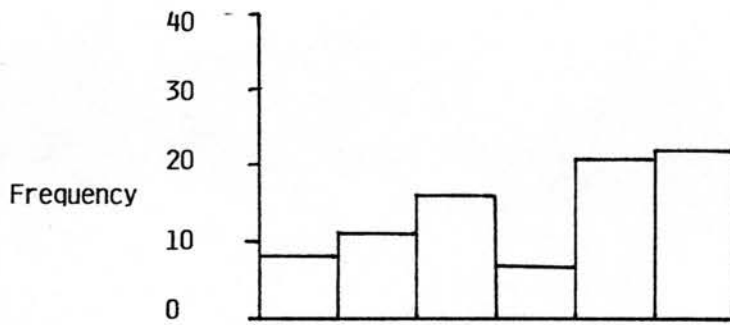
The infants most frequently smiled and laughed in response to the mothers' actions in person play. Forty two percent of all the infants' signs of positive affect occurred in these situations. (Figure 8.2). Positive affect was also frequently combined with their own contributions to person play and during communication with objects. Otherwise, smiling and laughter were rare. Only seven percent of the infants' smiles and laughter occurred during their own solitary activity. All the infants smiled and laughed more in

Figure 8.1 Frequency of infants' looks at the mother's face in different communicative contexts by age of infants. Results for all subjects in all conditions combined.

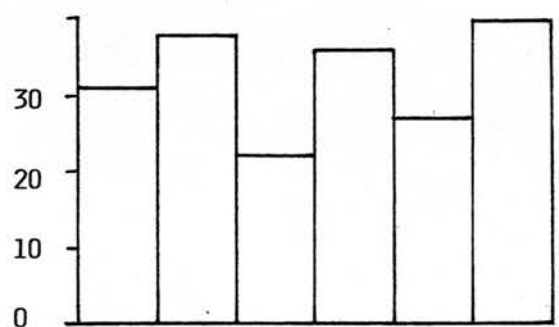
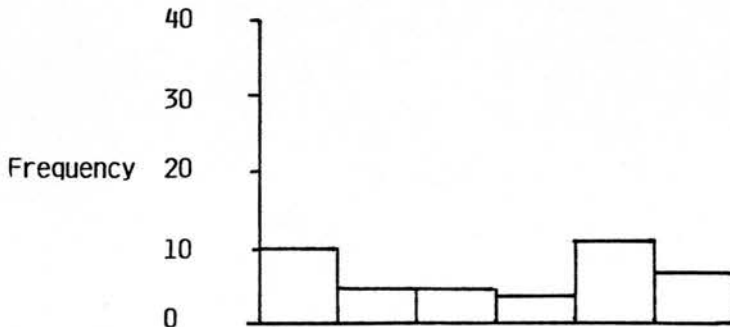
Communication with object



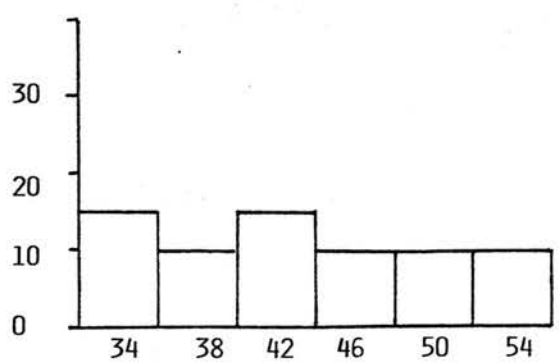
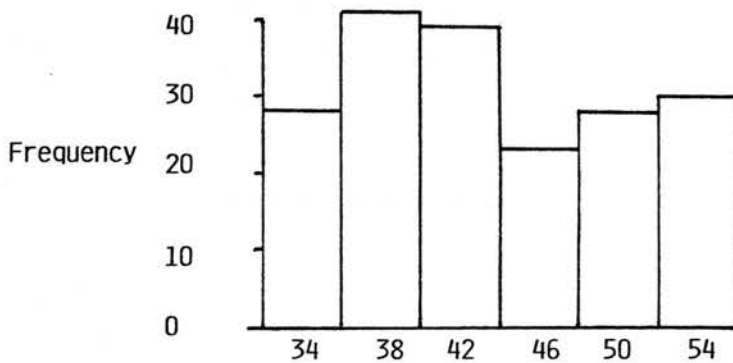
Person play



Personal attention and emotional expression



Solitary activity



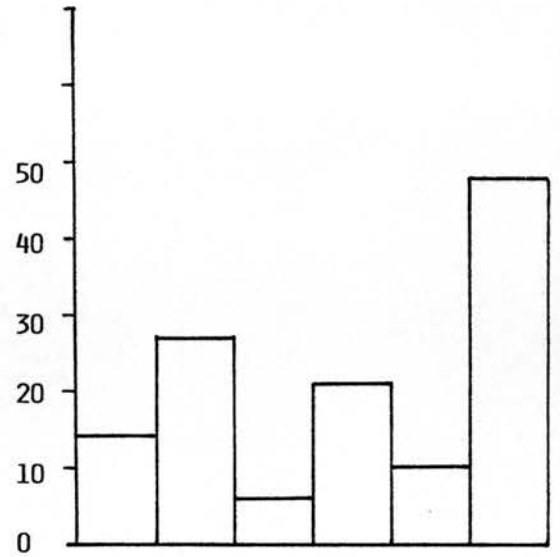
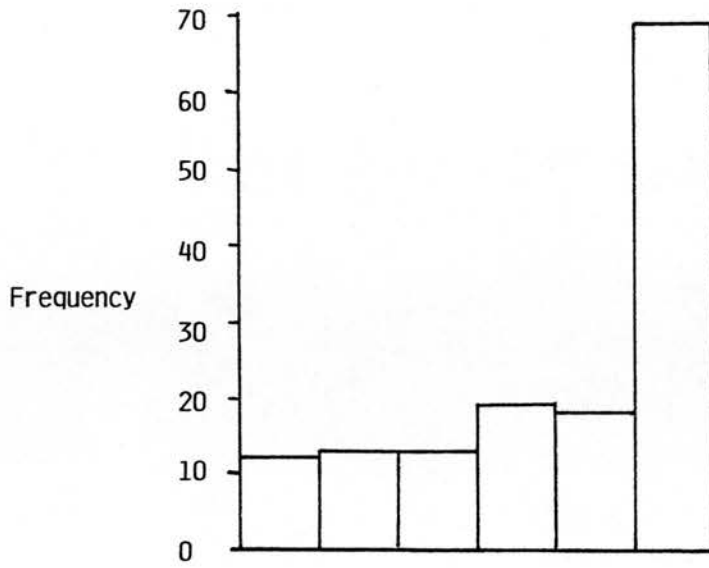
Age of infants in weeks

INFANTS' ACTIONS

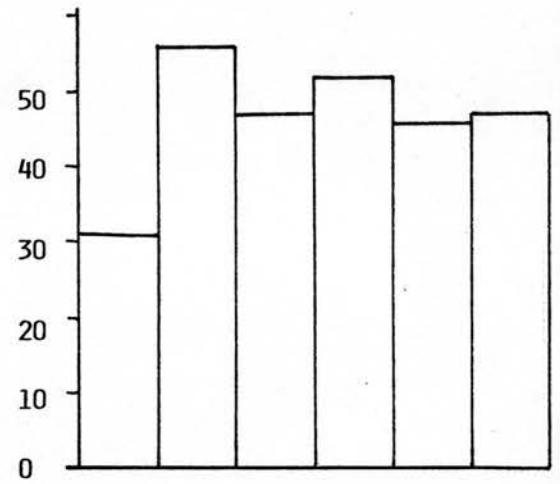
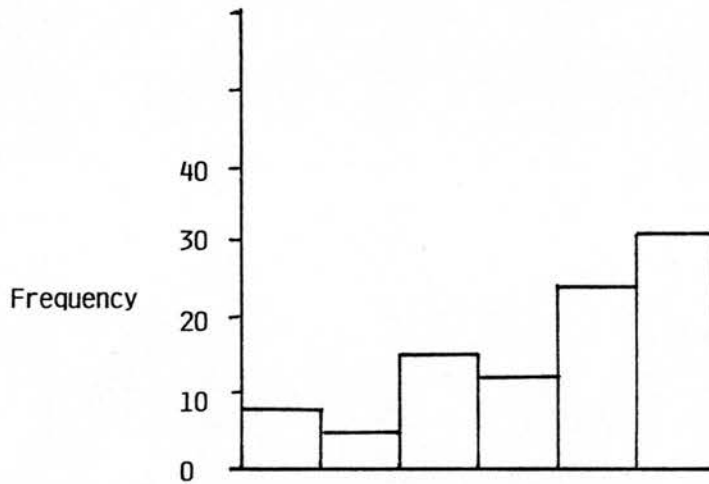
MOTHERS' ACTIONS

Figure 8.2 Frequency of infants' smiles and laughs
in different communicative contexts by
age of infants. Results for all subjects
in all conditions combined.

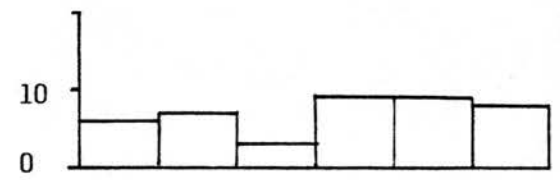
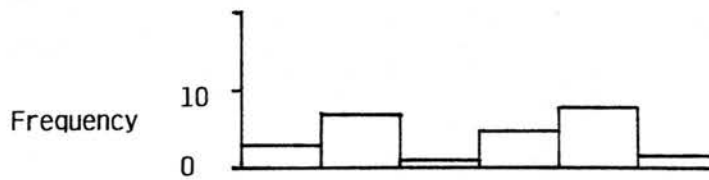
Communication with object



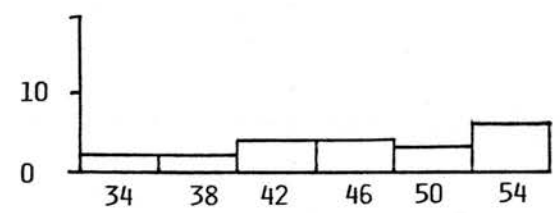
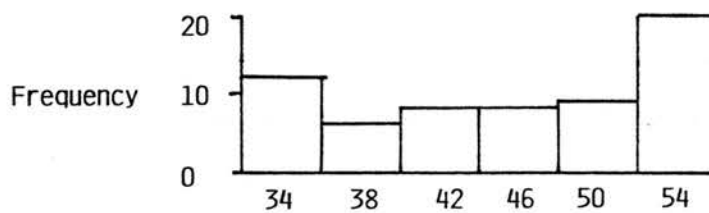
Person play



Personal attention and emotional expression



Solitary activity



Age of infants in weeks

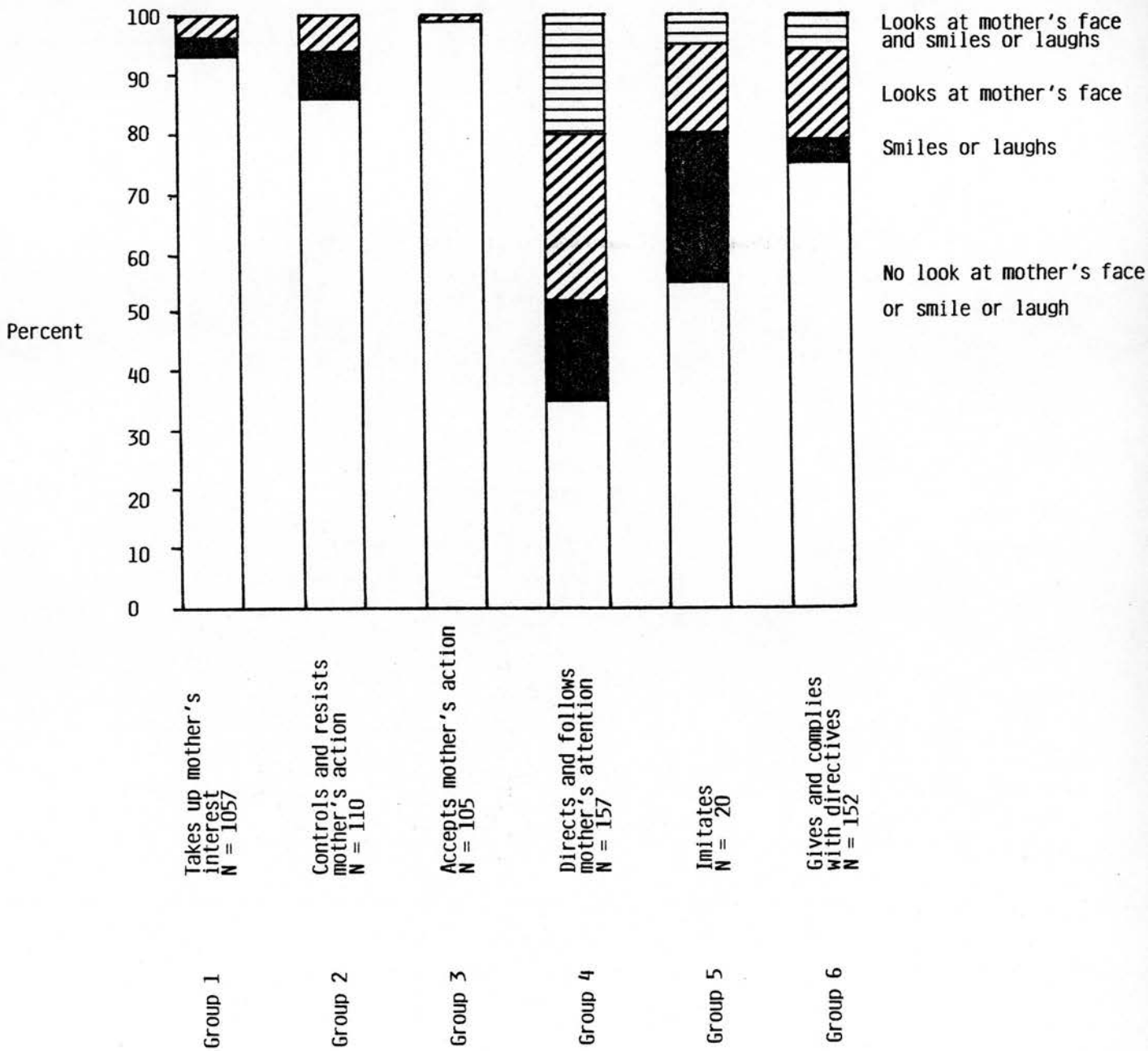
INFANTS' ACTIONS

MOTHERS' ACTIONS

the later sessions than the earlier ones as they performed communicative actions with objects or in person play. There were no other changes with age in the communicative contexts of positive affect.

The changes with age in the incidence of positive affect and interpersonal gaze when the infants performed communicative actions with objects are accounted for by the infants combining these interpersonal actions with the communicative actions that appeared and increased in frequency during the period of the study (Figure 8.3). Each of the infants frequently combined looks at the mother's face and smiles or laughter with actions to direct and follow the mother's attention (Group 4 of the communicative actions with objects) and with attempts to give and comply with directives (Group 6). The communicative actions of Group 4 that were combined with looks at the mother's face were, with two exceptions, actions of infants directing the mother's attention to an object rather than following when the mother directed the infant's attention. Actions to follow the gaze or pointing of the other occurred very infrequently in the observational situation used in which infant and mother sat in close proximity and most of the time had objects to handle, and none were combined with infant smiling or laughter. The infants also marked with interpersonal attention and positive affect a high proportion of their imitations of the mothers' actions on objects, a form of communication that may also be beginning to be used more frequently by the infants at this time. However, such interpersonal marking of the already established forms of communications (Groups

Figure 8.3 Percentages of different types of infant communicative actions with objects performed in combination with a look at the mother's face, or positive affect or both. Combined results for five infants at all ages in conditions of teaching, play with toys and when mother socially restrained.



1-3) was rare. Each of the infants combined a higher proportion of their communicative actions of Groups 4, 5 and 6 with looks at the mother's face (Sign Test, $p < .05$) or smiles and laughs (Sign Test, $p < .05$) than their communications classified as Groups 1, 2 and 3.

The infants also appeared to be differentiating with expressions of positive affect between the different types of contributions they made to person play (Figure 8.4). Each of the infants smiled or laughed proportionally more frequently when they performed a display or matched, opposed or complemented action in play than when they performed simpler actions of touching the mother, controlling her movement or touching her hand as it moved in play (Sign Test, $p < .05$). These groupings of person play were not differentiated by the infants' interpersonal gaze. Much of the touching play involved the partner's face and opposing play involved the partners concentrating on the rapid displacements of each others' hands and which focused attention away from the others' face.

The infants' interpersonal attention and pleasure differentiated their own directives and the mothers' compliant responses from the mothers' directives and the infants' own actions of compliance (Figure 8.5). Eighty four percent of all the infants' directives were addressed to the mother by the infant looking at her face and for sixty three percent of the mothers' compliant responses the infants either maintained their gaze at the mother's face, waiting until she complied, or they looked at her at the instant she did so. Usually the infants smiled or laughed in person play both when giving directives and when the mother complied. During communication

Figure 8.4 Percentages of different type of infant action of person play performed in combination with a look at the mother's face, or positive affect or both. Combined results for five infants at all ages in condition play without toys.

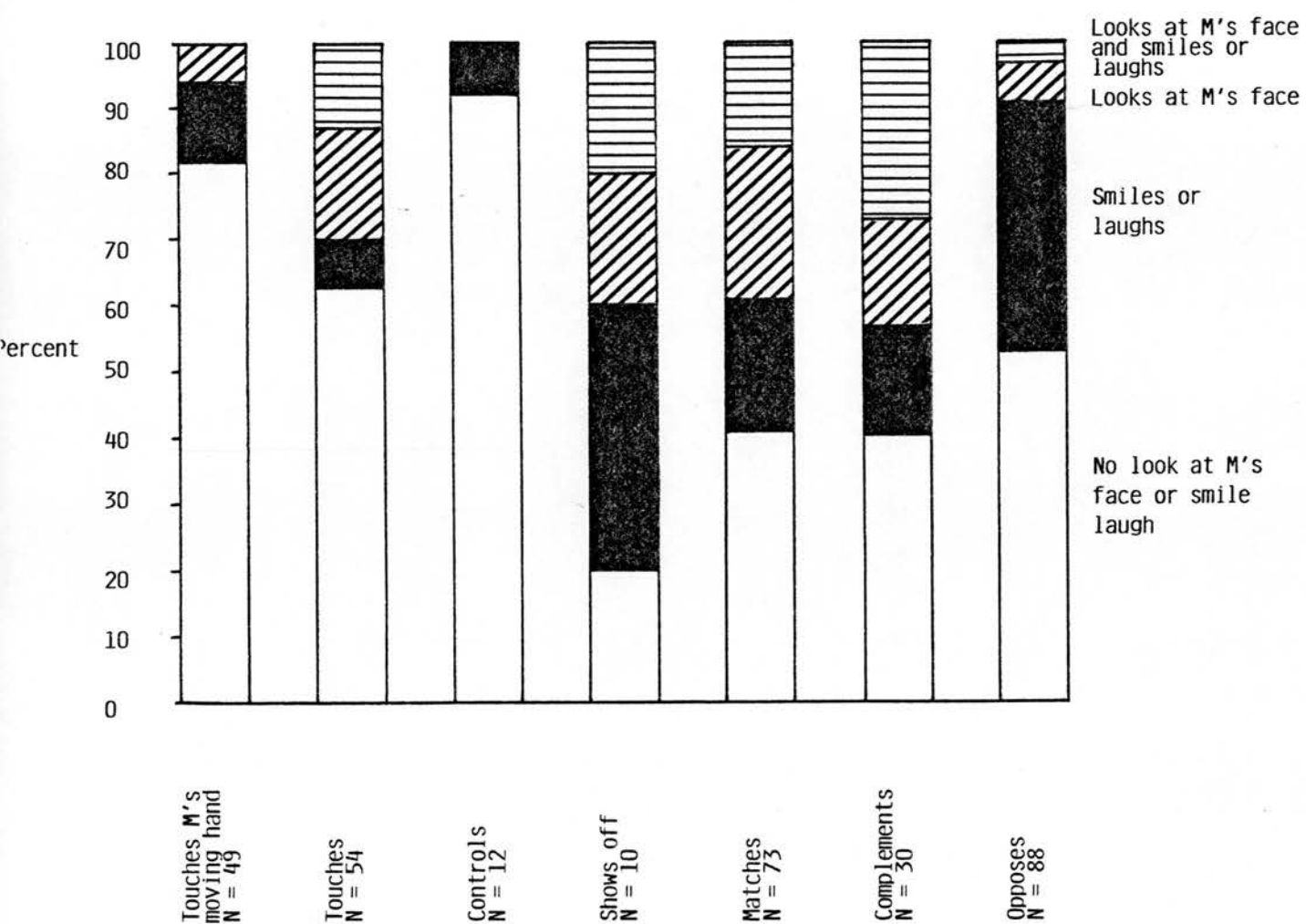
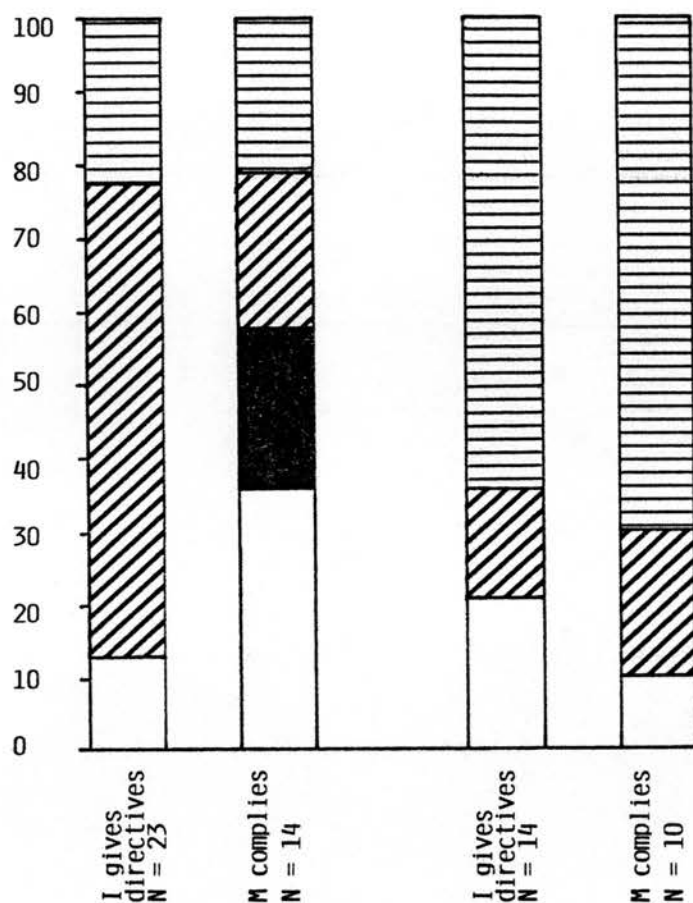


Figure 8.5 Percentages of directives and actions of compliance by both mother and infant accompanied by the infant looking at the mother's face, positive affect or both. Results for five infants in all conditions and all sessions combined.

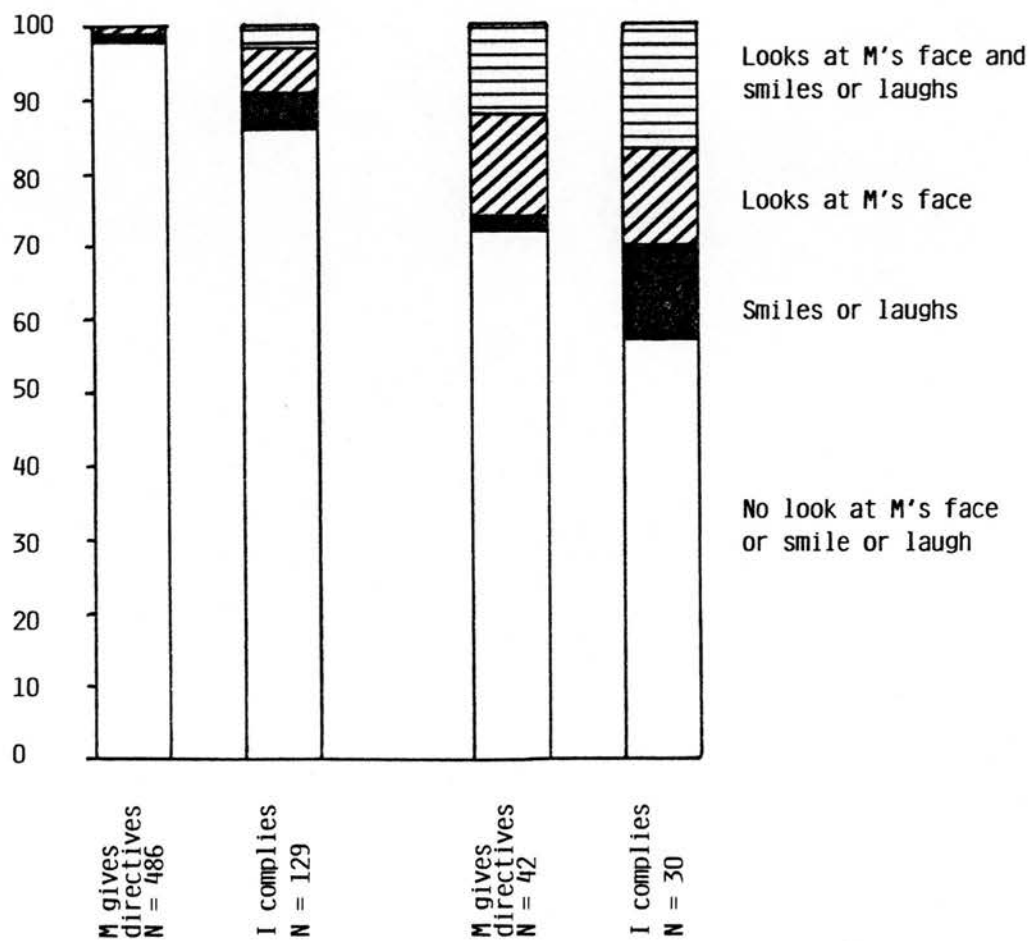
Communication
with objects

Person play

Percent



Percent



with objects most of the infants' directives were given in a serious manner; only twenty three percent were given with a smile or laugh. However, when the mothers complied the infants were more likely to smile, and forty three percent of these responses were greeted with infant smiles or laughter.

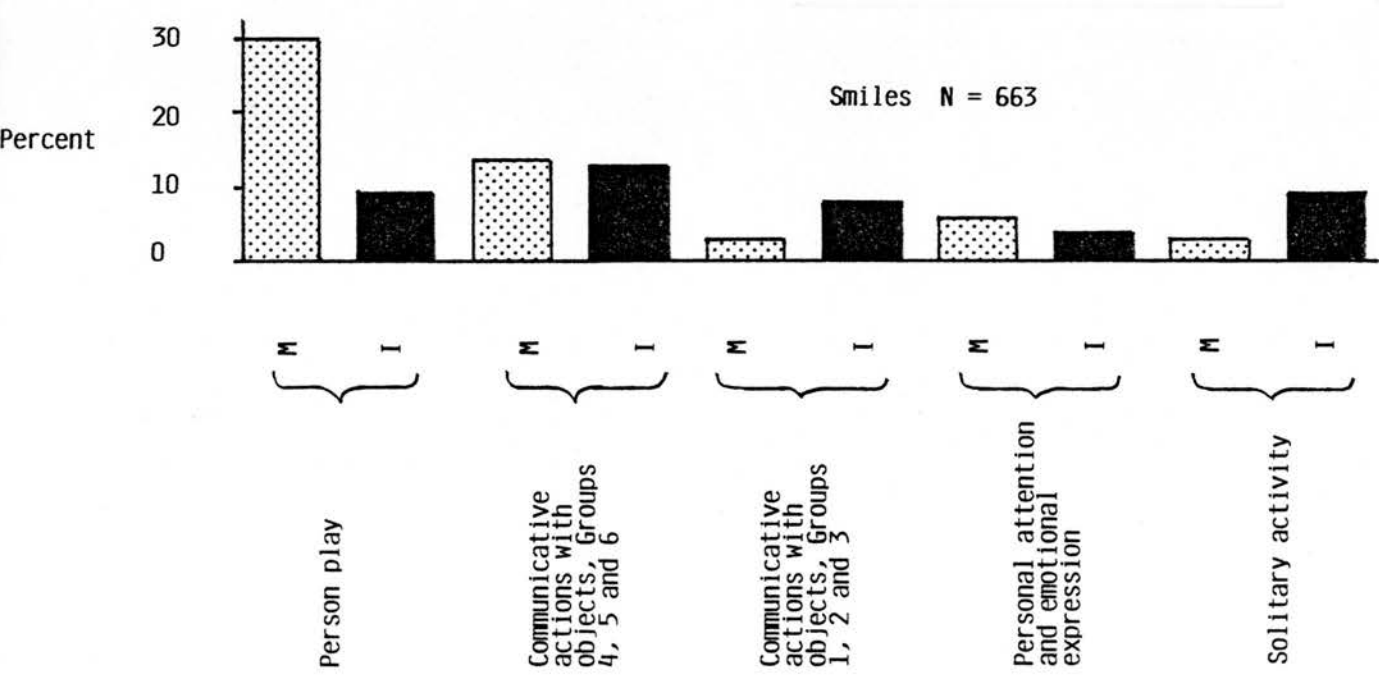
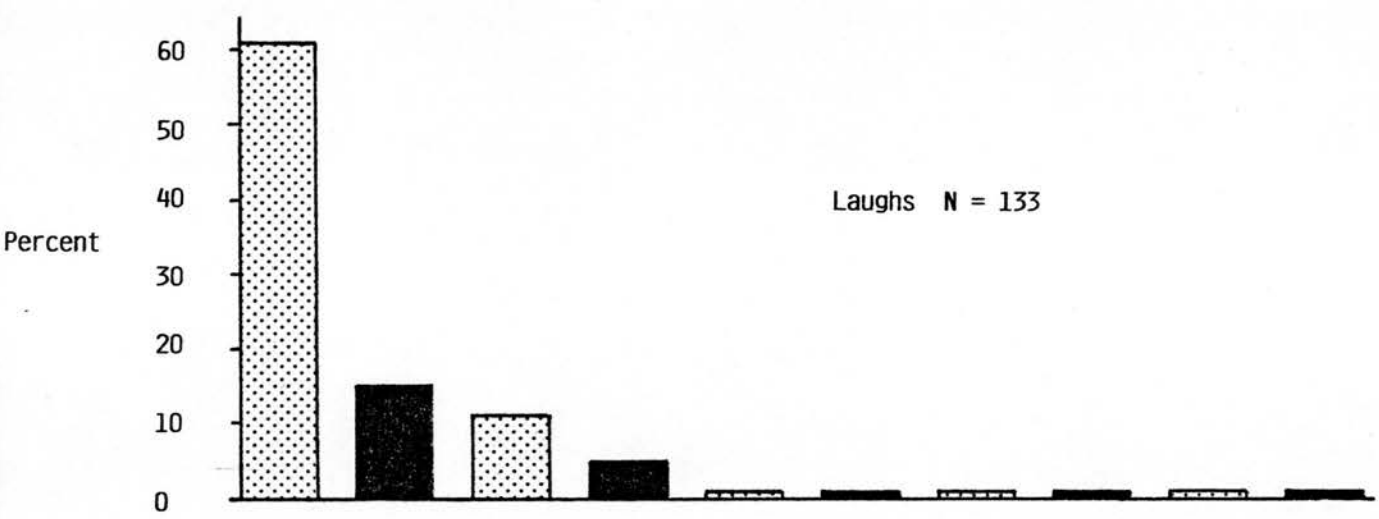
By contrast with the infants' directives, only three percent of the mothers' directives induced the infant to look at her face or show pleasure. Similarly only a small minority of the infants' actions of compliance (twenty percent) were accompanied by looks at the mother's face or smiles and laughter. In person play directives and compliant responses performed by either mothers or infants were more frequently differentiated by smiles or laughter than were the same communications about objects. It is not possible to state whether these group differences in interpersonal attention and pleasure while the infants and the mothers gave or complied with directives, applied to each of the individual infant subjects, as the incidence of infant directives was low and one infant did not give any directives during the recorded sessions.

8.4.2 Differences in the communicative contexts of infant smiling and laughter - The infants showed variations in the amount of laughter in the different sessions. They laughed a great deal in some sessions and not at all in others, and there was no apparent change with age in the use and frequency of infant laughter. However, the communicative context of infant laughter did differ from that of smiling. Laughter was expressed mainly in person play,

though it also tended to be used in communication with objects when infant or mother gave or complied with a directive (Figure 8.6). The infants laughed most frequently in response to the mothers' person play and in this situation occurred sixty one percent of all laughs and thirty percent of all smiles. Fifteen percent of the infants' laughs accompanied their own contributions to person play, compared with nine percent of their smiles. Seventy five percent of the infants' laughter when they performed an action in person play was linked to their more advanced play actions of display, matching, complementing and opposing. Only five infant actions to touch the mother, control her movement or touch her hand as it moved in play were combined with infant laughter.

The infants were more likely to smile rather than laugh in communication with objects. However, they laughed more frequently when performing a new communicative action for directing the mother's attention and action and complying with directives (Groups 4 and 6) as compared with taking up the mother's interest, resisting or controlling her movements, or accepting her helpful actions (Groups 1, 2 and 3) all of which were established forms of behaviour from the earliest session. There was only one instance of an infant laughing while imitating the mother's action on an object (Group 5). As the incidence of laughter was low and the individual subjects showed wide variability in the amount they smiled from session to session, it is not possible to determine whether each infant showed the same pattern in the use of smiles and laughter, but the group results are indicative of functional differences in these expressions of affect.

Figure 8.6 Comparison of percentages of infant smiles and laughs occurring with different kinds of action by infants and mothers. Results for five infants in all conditions at all ages combined.



8.5 DISCUSSION

The results show changes in the infants' use of looks at the mother's face and smiles and laughter associated with the developments in communicative action that occurred in the period of the study; notably with attempts by infants to direct the mother's attention and action in communication with objects and with their displays, matching, complementing and opposing in person play. The infants clearly addressed many of these new communicative actions to the mother by looking at her and in so doing they also indicated that they were waiting and watching for a response from her. The infants also expressed pleasure when directing the course of communication both in the presence of objects and in their absence. These changes in the infants' use of interpersonal gaze and positive affect suggest that the infants perceived that their new communicative actions had effects on the mother which were to be monitored and that they smiled or laughed as they asserted control over communication.

The distinction suggested by Bruner (1975) whereby an infant looks at the mother while provoking her agency, but does not do so when she was the recipient of an action, has only partially been supported by these findings. The infants were, indeed, more likely to look at the mother's face while giving a directive for the mother to act than they were when directing the mother's attention to an object. However, they also clearly showed interpersonal pleasure and attention with almost two-thirds of the latter type of communicative

actions. So, even when the mother's agency was neither required nor expected, the infants still demonstrated that they understood their action to have communicative and attentional implications for her. It is also important to note that the results show the infants did not invariably combine their directives with looks at the mother's face. While Bates (1975) suggested that a look at the adult's face demonstrated that the infant was trying to involve the adult in the infant's own action, in the examples Bates gave, the infant directives were not complied with immediately by the adult and the infant was repeating the directive gesture while watching the adult's face. The results of the current study suggest that frequently in shared action with objects, and sometimes in person play, communication can be carried solely through the joint manipulative action itself and the intentions thus expressed do not always receive emphasis or confirmation by a look at the partner's face.

Although communication with objects tended to be carried out with a more serious expression than person play, the findings suggest that infant looks at the mother's face and smiles and laughs were used for a similar purpose, to mark particular actions as interpersonally significant. However this topic could be examined more fully with detailed techniques of facial expression analysis devised by Ekman and Friesen (1975 and 1978) for adults and adapted for neonates (Oster and Ekman, 1977 and Oster, 1978). While infant laughs and smiles often appeared in similar situations, they were not apparently interchangeable. Laughter was expressed most in person

play and in communication with objects tended to mark either partner's attempts to direct the communication with gestures rather than the other kinds of communication with objects that involved taking up the partner's interest or physical intervention in the partner's action. The issue is possibly confused to some extent by the variability in the incidence of infant laughter in different sessions. Eastman (1937) suggested that the infant has to be in the "mood" for play and this factor may influence the intensity of the infants' expressions of pleasure. Here again detailed analysis of face movements could help establish whether infant smiles and laughter when they responded to the mother's actions, differed from those which occurred when the infants themselves asserted control over the direction of play or joint action.

CHAPTER NINE: THE MOTHERS' DESCRIPTIONS OF INFANT BEHAVIOUR AT HOME

9.1 PURPOSE OF INVESTIGATION

The main part of this thesis has concentrated on the behaviour of mothers and infants in the laboratory. As has been argued (p.39) the laboratory situation probably sampled more intense and prolonged interactions than would occur commonly in the everyday activity of mothers and infants, and it remains to be established that such cooperation as has been reported was part of the infants' ordinary communicative repertoires and not a behaviour created by the conditions of recording. In order to examine this issue the mothers were interviewed about their daughters' behaviour. It was expected that the mothers' reports would indicate that the infants showed similar changes with age in communication at home as they did in the laboratory, cooperating by giving and complying with directives, attracting the mother's attention to themselves and directing their attention to objects. It was also expected that the mothers would report other changes in the infants' social behaviour as described elsewhere, e.g. trying to perform self-caring behaviours like dressing and hair brushing (Illingworth, 1980) or showing affection (Griffiths, 1954). In addition, it was hoped that the mothers' accounts would give information about other changes in the infants' social understanding at this time.

9.2 METHODS

There may be problems with using the mothers' reports in research on infants and children. In particular mothers may exaggerate the infants' abilities and in order to avoid this, the procedure developed by Thomas et al (1963) was adopted. This involved getting the mothers to describe the infant's behaviour in specific detail rather than giving general impressions or interpretations. These were first time mothers who, it may be presumed, could not anticipate the normal process of development in detail and so any attempt to exaggerate the infants' abilities would have been conspicuous guess-work. In addition, they were not informed of the exact purpose of the study, having been told that it was an investigation into the infants' play. At the interviews and in other conversations with the mother, the researcher took an interest in all the infants' activities in order to avoid giving the mothers cues about the special aim of the study. In studies of socially and morally evaluated behaviours such as punishment, toilet training and responses to infant distress, informants may be expected to recount only those behaviours that they believe the researcher will approve. In this study the topic, cooperation, was not an area in which the mother would be likely to experience social approval or disapproval for a child of this age. Nonetheless the researcher tried to establish warm relaxed relationships with the mothers and infants so that the mothers could feel that their parenting skills and the abilities of their children were not being judged in an unsympathetic or critical way.

Probably the main problem with using mothers' reports in a study of cooperative understanding is that the mothers just may not notice significant behaviours even though they may respond to them appropriately, or they may forget to mention them. It is to be expected that some mothers will be better than others at observing and describing their infant's behaviour. Nevertheless, while the mothers may not give reports that are as reliable as those of a trained psychologist, they have the advantage of being able to describe the infants' behaviour in a wide variety of situations. Each is familiar with her infant's usual reactions and so is well prepared to notice any change in the infant's behaviour. The mothers' reports are presented here, not as complete records of the infants' development, but as evidence of the mothers' perceptions of their infants during the period of the study.

The mothers were interviewed twice using a slightly modified form of the interview schedule used by Thomas et al (1963) in their study of behavioural individuality in infants and children (Appendix D). This covers all the infants' everyday behaviours which helped disguise the interest of the study in cooperative understanding, as it questioned the mothers about behaviours that are clearly irrelevant, e.g. sleep patterns, soiling and wetting, startles and neuromuscular development. At the same time it ensured that the mothers were questioned about all the child care and social situations which could provide information about cooperative understanding in the baby. In addition the schedule could be used both when the infants entered the study and when they finished with no items clearly appropriate to one age only.

The schedule was modified to include two questions about the infants' expression of affection and attempts to get the adult to help. Also in the second interview, a question was included about the main changes the mother had noticed over the course of the study. The only other modifications were the exclusion of items obviously appropriate to children rather older than the subjects of this study.

It had been planned to interview the mothers when the infants were aged thirty two and fifty two weeks. However holidays and illness caused the interviews to be spread out from thirty to thirty five weeks and fifty two to fifty five weeks. The interviews were conducted in the subjects' homes and lasted about one hour each. They were tape recorded and later transcribed.

In addition to these long interviews, each time the subjects visited the laboratory the mothers were questioned for five to ten minutes after the video recording. They were asked about any changes they had noted in their infants' behaviour since their last visit and about any new infant behaviours or other events that occurred during the recording session. In this way the mothers could be prompted to discuss behaviours like giving, showing, pointing or showing off and describe when they noticed these and how the infants used them. The mothers were asked to give specific examples of their daughters' behaviours and all these interviews were also tape recorded.

Transcripts of the interviews were analysed to establish how the mothers perceived and described the infants' communicative abilities. The mothers' reports were examined to find joint actions which met the definition of cooperation used in this study. There had to be evidence of a shared plan in which each partner had a distinct role and this had to be entered into without coercion. For each infant the frequencies of the mothers' reports of infant cooperation, both giving and complying with directives, were found and the data analysed for changes with age. A similar procedure was employed in examining the mothers' reports of infant attempts to attract the mother's attention to themselves and direct their attention to an object. In making analyses of changes with age, reports given in the long interviews were combined with those in the nearest video recording session, the first or the last. In addition the mothers' reports were analysed to establish if they indicated any changes in the infants' imitation, attempts to perform self-caring behaviours or in their social and emotional behaviour. When reporting the results, the infants are identified by name with the age in weeks at the time the mother reported the behaviour.

9.3 RESULTS

9.3.1 Cooperation - There were reports of the infants both following directives and also giving directives for their mothers' assistance and each of the mothers gave more reports of their infants cooperating in this way during the second half of the study

than in the first (Sign Test, $p < .05$; Table 9.1A). The infants sometimes pointed at things they wanted, like a drink (Vanessa 50, Laragh 49) or a toy (Laragh 54, Ann 52). Eliza (53 wk) pulled at the mother's clothes and called out urgently on seeing a biscuit and in an earlier session she was reported to hand the mother a musical box to wind up again after it had finished playing (Eliza 47). One infant often played with containers putting the lids on and off and when she "got stuck" she handed them to her mother to help her (Laragh 49 and 55), and another infant pulled her mother to the fireplace to retrieve a toy that had fallen inside the fire-guard (Alison 54). Vanessa (46 wk) was reported as regularly directing her mother to repeat a move in a game. At bath time the mother entertained the infant by placing a toy on the side of the bath and then knocking it into the water. The infant then started placing the toy on the side of the bath and, looking at the mother, waited for her to knock it back in. At the same session the mother reported Vanessa requesting to be picked up by holding out her arms to the mother.

Even though not seeking help, one infant was reported to follow the mother's instructions when she was looking for a toy that had rolled away (Laragh 49). She looked to one side of the arm chair and then the mother, using gestures and speech, told her to go round to the other side. The infant did this and found the toy. This same infant was reported as cooperating with the mother when asked to bring an object she was holding (Laragh 49). At the next recording session the mother reported that the infant had turned this into a teasing game at first pretending not to notice the

TABLE 9.1 FREQUENCIES OF MOTHERS' REPORTS OF INFANTS' COMMUNICATIVE AND SOCIAL ACTIONS BY AGE OF INFANTS
RESULTS FOR ALL SUBJECTS COMBINED

Infants' communicative and social actions	Age of infants in weeks					
	34	38	42	46	50	54
A. <u>Giving and complying with directives*</u> (Sign Test $p < .05$)						
Requests assistance or action				3	3	4
Complies with directive					2	
Cooperates in dressing	1					5
Totals	1	0	0	3	5	9
B. <u>Directing other's attention to object and attracting attention to self*</u> (Sign Test $p < .05$)						
Vocalises to attract M's attention	2					5
Touches M to attract attention	1					
Approaches M to attract attention						2
Tickles M to attract attention						1
Shows off to adults					1	4
Shows off to infant					1	
Shows or gives object to M	2		6		2	
Points to object			1	1	2	
Offers or gives object to infant or child					2	1
Totals	5	0	7	1	8	13
C. <u>Imitation</u>						
Vocalisation	2	3				
Movement or posture			2	1		1
Action on object			1	1	2	
Imitates infant or child						5
Totals	2	3	3	2	2	6

TABLE 9.1 continued

Infants' communicative and social actions	Age of infants in weeks					
	34	38	42	46	50	54
D. <u>Joining in and watching adult's activity</u>						
Joins in appropriately with M's activity				2		1
Responds appropriately when M "shows" infant					1	2
Watches adult's activity					1	1
Totals	0	0	0	2	2	4
E. <u>Tries performing child care activities*</u> (Sign Test $p < .05$)						
Feeding and drinking self	4					15
Dressing self						5
Brushing own hair						4
Washing self						2
Totals	4	0	0	0	0	26
F. <u>Reactions to M's emotional responses</u>						
Seeking comfort when distressed						5
Seeking affection when not distressed						4
Looks to M in new situation				1		
Responds in similar way to adult				1		3
Distinguishes prohibited objects						2
Totals	0	0	0	2	0	14

mother and then handing it over with a laugh (Laragh 55).

At the beginning of the study, four mothers said their daughters resisted or did nothing while they were being dressed (Vanessa 32, Ann 32, Eliza 33, Alison 30) while the other mother said, "She almost appears to put her hands in..... she seems to sort of vaguely assist" (Laragh 35). At the end of the study however, all the infants were reported to clearly cooperate with dressing by pushing their hands into sleeves and two even lifted their legs when putting on tights and dungarees (Alison 54, Laragh 55).

9.3.2 Attracting and directing attention - In the second half of the study each of the mothers gave more reports of their infants performing these types of communicative action than in the first half (Sign Test, $p < .05$; Table 9.1B). Some of the mothers found that their infants were clearly trying to attract their attention from the beginning of the study. Two described them watching and making high pitched sounds which stopped when the mother turned round (Vanessa 32, Alison 30) and another reported the infant patting her if she was close by (Laragh 35). In the first long interview, the other two mothers said they had not noticed how the infant attracted their attention. However, at the end of the study they all reported the infants using characteristic calling vocalisations to get their attention. In addition the infants were reported to get their mothers' attention in other ways, e.g. holding out a toy (Vanessa 42) coming up to the mother (Eliza 53, Alison 54) or in one case, tickling the mother (Laragh 55).

Around the middle of the study all the mothers reported the infants began to give objects or food to them. The earliest report for this was for Alison at 36 wk. The mother reported that at first she had not realised that the infant was trying to give her a rusk. However, the infant persisted and the mother realised what the infant wanted to do and accepted it. She then began to give toys and the mother reported that the infant kept trying, sometimes calling for her attention until the mother accepted the toy. The other infants too gave both food and toys (Laragh 36 and 48, Vanessa 42, Eliza 42, Ann 42) and some tried to put biscuits into the mother's mouth (Eliza 42, Vanessa 42, Laragh 48). Shortly after the time they began to give, the infants started pointing to objects (Ann 50, Vanessa 50, Laragh 44, Eliza 42). One infant was reported to follow the mother's pointing (Vanessa 46) before she pointed herself (Vanessa 50).

Some of the infants were beginning to appreciate being noticed by other people. Two mothers reported them showing off to grandparents by walking up and down and getting out toys (Eliza 51) or lifting the skirt of her new pretty dress and calling out (Alison 54). The mother of Laragh (55 wk) described her "posing" while father admired her newly washed hair, and also sitting quietly to have her photograph taken. This mother also said that her daughter was quick to notice if someone else was noticing her, and described Laragh (54 wk) leaning out of the pram towards people in a bus queue watching and smiling at her.

9.3.3 Imitation - The infants also imitated other people (Table

9.1C). Two mothers described their daughters imitating vocalisations in the early weeks of the study (Alison 30 and 36, Vanessa 34). However, it was not until they were older that imitation of actions was reported. One infant regularly imitated clapping (Vanessa 42) and three infants imitated their mothers when eating. For one infant, this was spontaneous and involved picking out the currants from a pudding and eating them (Eliza 51), while the other two mothers deliberately provoked imitation by making exaggerated chewing movements when the infant had a large piece of food in her mouth (Laragh 40) or to distract the infant from "blowing raspberries" with a full mouth (Vanessa 46).

Three mothers described their daughters regularly imitating activities using objects, e.g. brushing teeth (Laragh 40), polishing the furniture with a cloth (Alison 46) and switching off the vacuum cleaner by leaning on the switch (Vanessa 50). Alison (54 wk) was reported as sitting in a child's chair watching television with her parents and occasionally turning round to look at them "to check she was doing it properly".

9.3.4 Joining in with others' activities - Several of the mothers' reports showed the infants' interest in and attempts to join in with the actions of other people. However it was not always possible to determine from the mothers' accounts whether the infants were complying with directives or imitating or both. Nonetheless these reports are recorded here to indicate the infants' interest in human agency (Table 9.1D).

Two mothers described their daughters wanting to watch adults doing things that were not related to the care of the infant. Ann (50 wk) liked to watch her father washing up, while Alison (54 wk) wanted to be lifted up to see her mother chopping vegetables. From the earliest sessions, some of the infants were reported to be trying to join in appropriately with mother's activity. Initially this centred on vocalisations, e.g. singing (Alison 30) and talking on the telephone with the mother to a relative (Laragh 35). Later reports showed the infants appropriately joining in with activities using objects. One infant placed pieces of fluff from the carpet in front of the vacuum cleaner to be sucked up (Alison 46). Another infant "helped" her mother planting geraniums and trying to write a letter (Laragh 44) and later placed vegetable pieces into a bowl as the mother chopped them up (Laragh 55). At the end of the study several mothers stated that they could show their infants how to do things and they gave examples of showing how to build with bricks or play with the cat with a piece of string (Eliza 53, Vanessa 50, Laragh 55).

9.3.5 Performing child care activities - In the second half of the study the mothers gave more reports than in the first half of the infants trying to perform actions like dressing and feeding themselves (Sign Test $p < .05$, Table 9.1E). These are not direct imitations of the mothers' actions as the infants had to change the action in order to perform it on themselves. At the beginning of the study the infants were starting to take an interest in feeding themselves. Two were beginning to use trainer drinking beakers

(Laragh 35, Ann 32). One showed satisfaction at being able to eat a rusk on her own (Ann 32) while another was trying to get food to her mouth (Eliza 33). Several of the infants were putting the spoon to their mouths, but not making any real attempt to spoonfeed themselves (Ann 32, Alison 30, Vanessa 32). At the end of the study all the infants used trainer drinking beakers and one mother even thought her daughter had decided "they're baby things" and wanted a cup without a lid (Alison 54). All the babies could finger feed and they were all keen to get hold of the spoon and try feeding themselves.

When first interviewed, none of the mothers reported the infants trying to dress themselves. However in the final interview all the mothers reported that their infants tried to do so, e.g. "waving her boots at her feet" (Laragh 55), "putting her vest on her head... putting her shoes on upside down" (Eliza 53) and "helping to pull the jersey over her head" (Vanessa 52).

At the beginning of the study two of the infants were described as trying to get hold of the hairbrush and chew it while having their hair brushed (Laragh 35, Vanessa 32). However, by the end of the study, they all clearly had concepts about how to use a hairbrush as they were reported as "trying to brush" their own hair (Eliza 53, Alison 54, Ann 52, Laragh 49) or even the mother's (Vanessa 52). There was only one report of an infant trying to wash herself (Eliza 53) though another mother thought the infant tried to imitate her bathing the infant by splashing (Alison 54).

Only one infant was reported to use child care activities with her dolls, i.e. engaging in symbolic play. At 40 weeks Laragh's mother said that the infant laughed when the mother put a bib on the teddy bear, and she played "nosey-nosey" (rubbing noses) with her dolls and stuffed animals. Her mother commented that "she responds to them as having faces". Later at 49 weeks, Laragh "gave a drink" to her doll and bear while visiting the laboratory for recording.

9.3.6 Reactions to the mother's emotional responses - A number of the mothers' reports showed the infants seeking out the mother's affection or apparently being aware of the mother's negative or positive attitude. These reports of infant responsiveness to the mothers' emotions and attitude were all given for infants in the second half of the study (Table 9.1F).

At the beginning of the study, when asked about their daughters' reactions to pain, all the mothers reported that they cried and were comforted when the mothers went to them, picked them up and distracted them. However, at the end of the study, as well as crying, all the infants took the initiative and turned to look at or went to their mothers "for a cuddle". Four of the mothers also reported that even when not distressed the infants sometimes went to the parents for affection (Alison 54, Vanessa 52, Laragh 49 and 55, Ann 52). This was observed by Vanessa's mother to be very recent behaviour while Alison's commented that previously her daughter had resisted being cuddled or kissed by her parents.

Some of the mothers reported the infants turning to look at them to assess the mother's response to their action. At 53 weeks Eliza's mother said her daughter "realised" she should not go to the drinks cabinet and on occasions she went there turning to watch how her mother reacted. Another mother described how her daughter could differentiate between objects the mother definitely prohibited, like the fire and television, and others that she "wasn't really bothered about" (Alison 54). When approaching the latter, the infant looked at the mother to see her response. Also when going to do something she had not done before she waited to be told it was alright to carry on (Alison 46).

Three of the mothers reported their infants taking on other people's reactions. The mothers of Laragh (55 weeks) and Alison (46 and 54 weeks) both recounted how their daughters responded very positively to people they had never seen before when the mothers themselves gave effusive greetings. Another mother reported that her infant usually enjoyed eating scrambled eggs, but when she was fed by her aunt who does not like them, she did not eat them as usual. The mother thought that the infant had been put off by her aunt's attitude and only ate them up when her mother took over the feeding (Vanessa 52).

9.3.7 Social behaviour with other infants and children - The infants apparently enjoyed being with other babies and children. Even one who did not regularly play with other children was friendly when she saw some in the street and called out to them. However,

when they approached she became shy (Vanessa 52). One infant was described as being fascinated at seeing a tiny baby and kept reaching out to pat it. When the baby started to cry she became upset herself (Laragh 35). The same infant was reported as responding in a more friendly manner on meeting her boy cousins aged 8 and 11 years than she would when meeting an adult. The mother believed this was because they were smaller, more her own size. The infant then quickly differentiated between the two cousins responding more to the older boy who "took the time and interest to play with her" (Laragh 44). An immediate friendly response to a strange nine year old boy was also shown by Alison (54 wks).

Three of the infants regularly spent time with other infants or children. While her mother worked, Alison spent one day and one afternoon each week with a boy one day older than herself and his mother. The subject's mother reported both her own observations and those of her friend, the boy's mother. At the beginning of the study Alison and her friend, Alexander, were described as taking a great deal of interest in each other, grabbing each other's hands, touching each other's faces and usually keeping close together (Alison 30).

As they grew older their play changed substantially. Alexander who could pull himself up to stand, reached Alison's shoes on a chair, gave them to her and they both laughed (Alison 46). At the next session the mother reported that they each showed off their "tricks" to each other with "always one doing and the other watching".

Alexander was very interested in Alison's shoes which were different from his own and she was seen to give them to him. At meal times they were fed in turn and the one being fed gave pieces of food to the other (Alison 50). In the final session the infants were described as copying each other racing around and shrieking, as well as following each other, sharing toys and playing games of alternate banging and vocalising. The other infants who regularly saw other children behaved in similar ways with their friends, offering or passing each other toys (Laragh 44 and 54), following and both blowing on whistles (Eliza 53).

9.3.8 Animals, television images and pictures - Three of the infants were reported to like animals and show special attention to them. One mother reported that the infant's vocalisations changed on seeing the cat, becoming more excited (Vanessa 34). Another infant called to the cat in a high pitched voice like the adults did and grew excited when she saw a dog in the street or on television (Alison 54). Vanessa and Laragh both played with their cats. Vanessa (50 weeks) waved a piece of string in the same way that her mother did for the cat to chase. As well as throwing paper balls for the cat to chase (44 weeks), Laragh (49 weeks) and her cat created an alternating game with the infant pushing a piece of carpet out of the window and the cat clawing it back in again. This was reported as lasting for three or four rounds.

Television was also a source of interest for some of the infants (including Eliza 47), with one infant particularly enjoying some of

the children's programmes (Laragh 54). Another infant waved when she saw crowds or a dancer waving his arms and also called out excitedly when she saw a cat or dog on the screen (Alison 46 and 54).

At the end of the study, picture books, catalogues, greetings cards, photographs and posters were of great interest to all the infants. They enjoyed looking at books and one infant was reported as spending fifteen minutes, longer than she spent with any toy, looking through a magazine (Vanessa 52). Another infant as well as looking at a catalogue for babies' and children's clothes and toys (Laragh 54), enjoyed being told the names of family members in photographs (Laragh 55).

9.3.9 Infant personality - The mothers' reports indicate that at the end of the study they perceived the infants to make expressions of will which they had not reported earlier in the study. Laragh (55 wk), Alison (52 wk) and Vanessa (52 wk) were described as being "determined" or having "a will of her own", while Alison (54 wk) was reported to have "purpose". Also three of the infants were described as showing temper when they were not allowed to do what they wanted (Laragh 54, Eliza 53 and Ann 52). Both Alison (50 wk) and Eliza (47 and 53 wk) were described as becoming "intelligent".

9.4 DISCUSSION

The mothers' reports show that they perceived major changes in their

infants' social and emotional behaviour. The infants began to engage in cooperative behaviour by seeking help, assisting with the mother's activities and following directives, as well as using other communicative actions about objects, like pointing, giving and showing and performing displays to attract the mother's attention. The mothers' descriptions of the infants at the end of the study as being determined or purposeful suggests that they perceived the infants to have new abilities to be effective in achieving their aims. During the study it appears that the infants began to take an interest in other people's attentions and actions, even those not directed at them and they were strongly inclined to participate, thus creating new opportunities for further cooperation.

It is not clear what the infants' conceptions of the mothers' behaviour were. However they were apparently attentive to the mothers' expressions of agency and perceived them as actions that the infants themselves could also try to do and so they had opportunities to develop elementary conceptions about the cultural uses of objects.

The mothers' accounts indicate that during the course of the study they perceived the infants to have new conceptions of other people that took account, not only of personal agency, but also of emotions and attitudes. The infants not only took from the mothers ideas about how to use objects, but also sought to establish their attitude towards the infant's own behaviour and towards other people. It appears that the infants acted as though the mother's actions and attitudes were significant for their own behaviour and

they were receptive to her intentions and emotions in relation to other people as well as themselves and physical objects. Lewis and Feiring (1981) in a study of fifteen month olds' reactions to strangers, also found that infants were influenced in their social responses by the way they had seen their mothers behave. They communicated more with the stranger that they had seen the mother talking and smiling to, than they did with the stranger with whom the mother did not interact.

The reports of the infants' differential social behaviour are confirmed by the findings of Lewis and Brooks (1975) that infants at the end of the first year distinguish between different aged subjects. Further research would be needed to establish how these discriminations develop. However, the accounts of the infants giving objects to and imitating other infants of similar age are important, as they indicate that the infants did not require an adult to support these types of interactions and that they perceived another infant as an appropriate partner. Some of the infants also played with household pets. This and their attention to both animals and people on television and in books indicates a general high awareness of and interest in the bodies and actions of animate beings.

The mothers' reports confirmed that the infants cooperated in a variety of everyday circumstances with a variety of partners and this cooperation increased during the period of the study. Thus indicating that the beginning of cooperative action was part of a

development in the infants' communication and was not created by the conditions of laboratory study. In addition, they described important social and emotional changes at the end of the first year which give important information about the growth of interpersonal understanding and could provide fascinating though difficult areas for further research.

CHAPTER TEN: DISCUSSION OF PERSONAL AGENCY IN COOPERATION AND THE
IMPLICATIONS OF COOPERATION FOR EARLY DEVELOPMENT

10.1 SUMMARY OF RESULTS

The results of this study confirm that cooperation in the form of giving and complying with simple gestured directives began to be used by the infants at the end of the first year. All the infants responded to the mothers' directives in communication with objects and four of them did so in person play while the same four also issued directives to their mothers. The appearance of cooperation was accompanied by other changes in mother-infant communication. When older, the infants began to perform actions on objects to attract and keep the mother's attention, and they reduced their tendency to take up the object the mother was handling and then act on it in a manner irrelevant to the mother's action. The mothers showed corresponding changes in their behaviour, increasing the number of directives they gave as the infants grew older and in the teaching condition, changing their strategy of teaching by reducing the frequency of demonstrations and impositions in favour of instructions. Examination of the data led to the conclusion that of four alternative explanations for the onset of early cooperation, social learning theory, observational learning theory, symbolic interactionism and the theory of innate infant intersubjectivity, the last was consistent with the findings of this study.

The suggestion made by the theory of infant intersubjectivity that the changes seen in communication with objects were part of a general change in the infants' conception of communication, was supported by finding parallel developments in person play. The younger infants were predominantly concerned with touching the mother, simple control of her movements or touching her hand as she poked or tickled the infant or made entertaining displays. When older, the infants exerted greater influence over the course of play by making displays themselves and matching, adding to or opposing the mothers' play actions. Early cooperation was apparent in infants giving and complying with directives for particular play actions and was specifically important in the expressions of complementary play.

The infants showed that they did not depend on their mothers to construct their communication. When the mothers were socially restrained, the infants emitted similar actions trying to initiate communication and direct the mother's attention and action as they had used when the mothers were fully interacting social partners. Overall the mothers tended to initiate communication and the infants to terminate it and, while there were marked changes in the content of the communication over the period of the study, the pattern of initiation, termination and turn-taking, as well as the duration of communication sequences, was established before these communicative developments occurred. However, the infants adapted to the mothers' social restraint and in that situation increased their tendency to initiate communication.

The infants tended to mark selectively their directives, displays and imitations with looks at the mother's face, smiles or laughter, indicating that they conceived these new types of action to have implications for the mothers' actions. The mothers' reports indicate that at the same time as the infants were seen to comply with directives, issue directives and perform displays in the laboratory, the infants also showed similar changes in their communication in their everyday activities at home. Overall the results confirm the proposition that at the end of the first year the infants were going through an endogenous change in their intersubjective understanding of persons, which was expressed in and supported by appropriate interactions with the mother and other people.

10.2 THE NATURE OF INFANT COOPERATION

In discussing the nature of infant cooperation, theory and evidence from cognitive developmental psychology may help to clarify the relevant issues. Of particular importance in studying this topic is Piaget's (1954) study of infant causality in which he used the concept of "efficacy" referring to the feelings of effort and longing that accompany action and of "phenomenalism" which refers to the temporal contiguity of two events indicating that one caused the other. According to Piaget, efficacy eventually leads to psychological causality, i.e. the sense in a self aware individual of causing one's own actions through volition. Phenomenalism

becomes physical or objective causality, the causal action of one object on another through spatial contact. However, this level of refinement is a long way in the future for the young infant as in the early stages of the sensorimotor period, efficacy and phenomenalism are intricately mixed so that the infant locates the cause of events in his own activity. Piaget considered that the infant

"seemed to see in the movements of things only events in which he himself participated" (p.269)

It is not until stage 4 that the infant begins to differentiate his feelings of efficacy from external events and so begin to conceive of forces separate from his own. An infant can now

"set in motion an intermediary capable of producing a (desired) result" (p.203)

and moreover he

"attributes to someone else's body an aggregate of personal powers" (p.261)

Piaget suggested that the activity of another person makes the greatest contribution to the infant attributing causality to the external world, and he found that the stage 4 infant is no longer acting on someone else's body as inert matter to achieve his own result. Rather he is using gentle pressure or touch to evoke a repetition of something he desires.

Piaget considered that imitation is crucial in the differentiation of efficacy and phenomenalism

"because through imitating someone else the subject succeeds in attributing to his model's action an efficacy analogous to his own" (p.318)

This emphasis on imitation keeps to a minimum the influence of other people on the infant's development of causality because it ignores other forms of communication, including displays and cooperation described in this study and also because imitation itself is not necessarily communicative, but may be a solitary activity performed for the person's own interest or pleasure. Piaget's categories of psychological and physical causality also seem to ignore the influence of other people as causal agents and give an impression of individuals largely isolated from each other, but well adapted to self examination and to understanding the physical world.

It appears curious that such emphasis should be placed on physical causality as it is only rarely that events in an infant's world occur without a personal initiator. Apart from events like the movements of sun, moon and stars, changes in the weather and air, water and earth movements, most of the things that happen in the everyday life of a young child are set in motion by persons or animals, i.e. animate beings. The events reacted to by Piaget's children were created by Piaget himself and even he acknowledged the influence of animism in the young child's thought (1973).

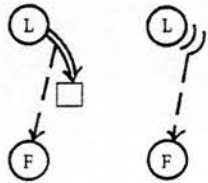


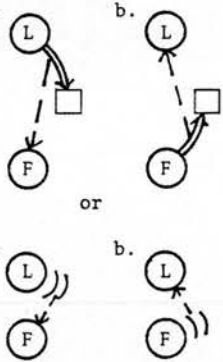


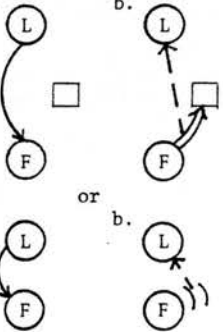


When discussing the communicative change at the end of the first year, Bretherton and Bates (1979) point out that there is a qualitative difference in an infant using a tool to achieve an end





(e.g. pulling a string to get a toy) and directing a person to do something (e.g. instructing the mother to give a toy). This difference lies in the distinction Aristotle made between "efficient" and "final causality". The chisel is the efficient cause in making a statue, while the final cause is the plan in the artist's mind. They suggest that the infant, in coming to use causality in his communications, has to come to understand that the plans and intentions of persons are final causes. This emphasises the importance of trying to understand another person's communicated intentions, a conception that goes beyond and incorporates Piaget's proposals about the role of imitation in the development of causality. So it appears that in understanding cooperation it is important to consider fully the infant's understanding, both of his own agency and that of other people.




10.3 THE INFANTS' UNDERSTANDING OF PERSONAL AGENCY IN COMMUNICATION

A picture of the growth of understanding of causality as expressed by people, i.e. personal agency, may be obtained by analysis of the communicative behaviours of infants. In this study, both mothers and infants used several clearly identifiable forms of communication that define their agency with respect to their partners and they reciprocated by adopting complementary roles in engagement. These behaviours reveal the structure of the infants' conceptions of personal agency, both their own and that of other people (Table 10.1). The infants' own expressed agency at this time is not confined

TABLE 10.1 THE DEVELOPMENT OF THE INFANTS' CONCEPTION OF PERSONAL AGENCY AS EXPRESSED IN COMMUNICATION

Age		42 wk approx	54 wk approx
A. <u>Display of agency</u> e.g. "showing off", object displays, touching		1. <u>Mother as leader</u> I perceives focus and effects of M's actions	
		2. <u>Infant as leader</u> I perceives that his own actions attract or please M	
B. <u>Self-induced transfer of agency</u> e.g. imitation, assistance, matching and opposing play actions		1. <u>Mother as leader</u> I receives feed- back from M's action that his actions have predictable out- comes which M can perceive	
		2. <u>Infant as leader</u> I perceives that M's actions have predictable out- comes with which he can join in	
C. <u>Other-induced transfer of agency</u> e.g. giving and complying with directives		1. <u>Mother as leader</u> I perceives that M has plans for his action which he is able to fulfil	
		2. <u>Infant as leader</u> I perceives that he can create plans for M's action	

 = Leader in communication
 = Follower in communication
 = Object
 = communicative action on object

 = personal display or body movement
 = perception of action
 = communicative gesture
a.b. = sequence in time

to manipulations of the physical world, but is shown to others in forms of social play which use metacommunications to regulate interpersonal understanding and intentions. By the end of their first year, all of the infants had taken both the actor and recipient positions in most of the patterns of personal agency in communication, both in communication with objects and in person play.

The results show that in the period of study, the infants went through three steps of advancement in their understanding of personal agency as expressed in communication. From the earliest session the infants had been responding to the mothers' displays of agency by watching and sometimes laughing (Table 10.1, A1). They had also been the recipients of the mothers' actions of imitation and assistance (B1), thus possibly receiving feedback about both the equivalence of the effects of the mothers' and their own actions and also about the ability of another person to understand the infant's own intentions. Also, from the first session, the mothers made unsuccessful attempts to direct their daughter's action by giving directives (C1). However, as yet the infants' attempts to join in with the mother's action were not guided by her.

An advance in understanding of personal agency was apparent as the infants gradually started to influence the mothers by attracting them to watch their displays (A2). At the same time the infants started taking over the mothers' plans of action in both

self-induced (B2) and other induced (C1) transfers of agency. It was not until they were approximately one year old that some of the infants showed a further advance in understanding personal agency when they combined their knowledge about influencing the mother and about transfer of agency through communication in attempts to get the mother to take up the infant's own plan of action (C2).

Earlier it was suggested that in dealing with the infants' use and conception of intentionality the question at issue was not at what age an infant became intentional. However, it is necessary to clarify the changes in an infant's intentional functioning. The steps in conception of personal agency seen in the communication of infants with their mother constitute new forms of intentionality. The infants were developing from being selectively attentive to their mothers' actions to a condition where they set out to attract the mothers' attention and also take up her plans as expressed by her actions. Some of the infants showed more complex intentionality at one year by creating and communicating their own plans for the mothers to follow. Thus fully reciprocal gestured cooperative behaviour was apparently the most advanced form of intentionality expressed by the infants in this study. These evident changes in interpersonal intentionality suggest that at the end of the study the infants may have been beginning to perform "acts" as defined by Harré (1982) as their directives and displays depend for their effect on the way they influence another person and are not solely related to the infants' own intentions. By

the form of their behaviours and their attempts to address them and monitor the mothers' reactions, it appears that the infants did have intentions to produce particular effects in their mothers. However, the performance of "acts" was still at a very rudimentary practical level and did not employ conventionally agreed forms, but depended for their effect on a generative communicative ability in a jointly established context for action.

The changes in agency expressed in communication require comprehension of the logic of action. Particular events have to precede others and so the infants must have some knowledge of the necessary order of actions. The infants also had to allocate responsibility for action to the initiating agent. This was as yet at an elementary level, but the infants were now able to integrate their intentions with those of their mothers in a fundamentally new way. Bretherton and Bates (1979) discussing this point, suggested that the infant must develop what Premack and Woodruff (1978) have termed "a theory of mind" in which the infant imputes mental states to himself and to others. However, Bretherton and Bates believe that this is not sufficient and that

"the baby must realize that she can interface her mind with that of a partner or develop a theory of interfacing minds" (p.89)

This restates Trevarthen's conception of intersubjectivity except that he would not attribute to the infant anything so self-consciously rational as a "theory".

Bretherton and Bates have suggested that

"the child in order to communicate intentionally, must understand *first* himself and *then* the partner as final causes" (p.89, author's italics)

It is not clear by what criteria they would judge the infant's understanding of final causes other than in the way he expresses these concepts in communication; in which case the order they give for the development of this understanding is not in agreement with the findings of this present study. The infants were directed by their mothers before they gave directions to their mothers. Also they responded to the mothers' displays before they performed displays themselves. This discrepancy with Bretherton and Bates' position presumably arises because they did not look for evidence of infants fulfilling directions from other people, but focused attention solely on infant initiated action.

The finding that the infants initially took the responsive or recipient role in communication suggests that they may be able to develop understanding of the leader's role by observing the mother. This observation could, through the infants' intersubjective understanding, allow the infant vicarious experience of the leader's role at the same time as he is experiencing the direct effects of the mother's communicative action. It would appear that an intrinsic growth in the mechanisms of interpersonal understanding of agency gives the infant new ways of "standing in the shoes" or "entering the mind" of other people at the end of

the first year. Their understanding is, of course, not nearly as comprehensive as the interpretation placed on one adult's action by another adult, but it permits the infant to perceive in an elementary way the communicative and cooperative intentions expressed by the mother.

It is important to note that in this study the infants did not change all their communicative behaviour to those showing the more sophisticated forms of attracting the mother's attention, imitating or engaging in cooperation. The majority of their communicative actions with objects continued to be those of taking up the object the mother was handling and then acting on it in a manner irrelevant to the mother's action. In social play the infants frequently touched the mother's active hand without adding to the course of play. This indicates that the mother's action was attractive to the infant even when it did not specify the infant's action. It could be that these apparently simpler infant behaviours show principles of general attention to other people's activity and desire to become involved in it, which is characteristic of human curiosity. This attention to other people's action could provide a basis for development of the understanding of personal agency and may be seen in the curiosity of adults as they watch novel actions or examine objects and equipment and try to work out how an effect is achieved.

The infant who at one year has begun to cooperate with the mother, has not, however, become fully compliant. At about fifteen to eighteen months of age infants show strong negativity and resistance

to other people's wishes (Spitz, 1957) and researchers have found that infants of this age are difficult to test because they do not cooperate with the testers (e.g. White and Watts, 1973). When younger, the infants showed they could attend to or ignore the mother's attempts to attract their attention, so it appears that the older infants too choose when they will cooperate. As their understanding of agency grows, the infants apparently are able to assert their personal will and cooperate or resist in more complex ways.

The results of this study into the gestured communication of infants show interesting parallels with Halliday's (1975) description of early language use. In a study of one infant, he found that the infant showed a rapid change at about sixteen-and-a-half to eighteen months. The infant began to take on distinct communicative roles in his use of language and to engage in spoken dialogue. At this time the child started to reply to a question with a spoken answer and to respond to a command, not only by obeying the instruction, but by verbalising his action. He could continue a conversation by adding his own contribution and he began to initiate spoken dialogue.

This change in the use of vocalisations half way through the second year is very similar to the changes shown by the subjects in this study who began to communicate using gestures about objects and actions. They began to respond to and give gestured commands for objects and actions and also continued a game by making their own

contribution. In taking on different communicative roles, both responsive and initiatory, they began to engage in non-verbal "dialogues" about objects and actions. Thus it appears that infants begin to show reciprocity in gestured communication about objects and their body movements before they have any spoken language or have at best very little speech. Then some months later, these gestured communications can be replaced or expanded by spoken language. However, there are many questions about the relationship between gestured and spoken communication at this early age that provide a fruitful area for further research.

Personal observation suggests that adults very rarely use cooperative gestures on their own, though they are often used in combination with language. The cooperative gestures used by mothers and infants, e.g. "asks" for or "offers" an object or "indicates a locus", are the same as those used between adults appearing to indicate that these gestures show little change during development. Similarly, the actions used in social play, like tickling, poking and showing off, also appear to continue with little change, being used in play between children, adult friends and lovers, as well as by parents with their children. However, over the years of development the meanings and intentions of cooperative gestures and play activities also come to be expressed in alternative communicative forms, e.g. spoken and written language or formal games with rules, and it appears that after the first year the major development of cooperation uses these communicative forms rather than non-verbal gestures.

10.4 IMPLICATIONS OF AN INTERSUBJECTIVE UNDERSTANDING OF COOPERATION FOR INFANT PSYCHOLOGY

10.4.1 The structure of intersubjective knowledge and symbolism.

The finding that the infants did not precisely duplicate the mother's actions when using the new communicative forms gives indication of the intrinsic structure and autonomous functioning of the infants' intersubjective mechanism. From the outset they did not focus on the detail of the actions, but seemed to relate to the nature of their communicative effects, i.e. to attract or keep attention, to entertain, to share an interest, to demonstrate the ability to imitate, to enlist help or cooperation.

Lock (1980) points out that infant gestures are a simple form of symbolic communication. These gestures are not entirely arbitrary symbols as they are founded on innate anatomical relations to psychological or behavioural effect. They are similar to the orienting or manipulative movement that they designate. However, if indeed the infant's intersubjective understanding is organised around general principles for creating different types of communicative effect, then this could provide a basis for subsequent development of symbolism. The infant's intention to attract the mother or involve her in the infant's own plan can be achieved through a variety of gestures or actions. This shows differentiation between the intention and the form of expression, and the relation between these is to some extent arbitrary as a number of expressions may serve the end of engaging the mother in a particular

way. Social play is a striking example of this principle when the playful metacommunication gives a different meaning to an "attack" from that given to it by the form of the action alone. There is a distinction between the act, physical assault, and the underlying interpersonal meaning of affectionate intimacy which indicates that the infants may have some primitive understanding of the relation between serious and non-serious interpersonal activity that may be a precursor of later make-believe or pretend play.

10.4.2 Intersubjective understanding and knowledge about the physical world - There is in psychology a view that infants have abilities to understand people and interact with them separate and distinct from abilities to understand and use physical objects, e.g. Bretherton and Bates (1979) who suggest there is a distinction between social and non-social tool use, and Lock (1980) who distinguishes between individual and social objects. However, it is not clear in which way an object may be non-social or individual, as most of the objects in the human environment are created and given meaning by culture and are not purely physical. Even for adults, knowledge about the physical world is in terms of the culture's beliefs and philosophical ideas.

Objects have meanings and functions defined by culture which the infant sees expressed in the actions of adults. The infant who has begun to understand personal agency can begin to learn about the cultural uses of objects by watching adults and by engaging with

them in joint tasks. In this way the ability to understand personal agency provides the infant at the end of the first year with a new psychological tool for understanding the physical world as it is employed by other people. Support for this argument comes from evidence that in their solitary activity with objects, infants show socially or culturally defined ways of using objects (Uzgiris, 1976; Fenson et al, 1976). This change apparently is stated to occur in stages 4 and 5 of the sensorimotor period, i.e. towards the end of the first year when the infants in this study began to cooperate.

Both academic research and educational practice have tended to emphasise the individual working on his own. However, evidence for the inherent cooperation in learning comes from the finding that pairs of children playing and doing intelligence tests reach a higher intellectual level than either on their own (Sylva et al, 1980; Glachan and Light, 1982). Thus it appears that cooperating and sharing ideas may be of value in developing conceptual understanding in childhood as well as infancy.

10.4.3 Intersubjective understanding and knowledge about the social world - This study shows that the infants had a new understanding about agency both in the use of objects and in body movements. The former is clearly important in understanding the vast range of cultural artefacts and constructions, while the latter introduces the infant to the cultural significance of his own body and relations with other people. At the end of the first year, an infant usually begins to show independence by assisting in his physical care, e.g. feeding himself and helping to dress, and

starts to use a culturally defined form of greeting by "waving bye bye" (Illingworth, 1980). He is applying his new understanding of personal agency by joining in these everyday activities in a manner that shows some understanding of the desired goal.

A frequently studied aspect of the relationship between mothers and infants at about eight to nine months is the infant's distress and fear when the mother leaves the room and a stranger approaches. A variety of explanations has been offered for this phenomenon. Berlyne's incongruity hypothesis (1960) has been applied to this issue by some cognitive psychologists, e.g. Schaffer, 1966 and Kagan, 1970 . However, in discussing this, Lewis and Brooks (1974) point out that discrepancy leads to general arousal and cannot account for the infant's fear. Further, the incongruity hypothesis does not consider the interpersonal meaning of the event for the infant.

Lewis and Brooks (1974) have discussed the importance of the child's concept of self in his reaction to strangers. They point out that this involves not only a differentiation between self and other, but also the development of a categorical self based on categories which the infant uses to distinguish between people. They found that strange adults are frequently responded to by fear, while strange children are treated in a friendly manner and they suggest that the infant perceives the adult as very different from himself and the child as similar and so less threatening. Further work (Lewis and Brooks, 1975) has led them to confirm

that the youngest infants they studied, aged ten to twelve months, were already beginning to discriminate between persons of different ages and to show visual preferences for those of the same age and sex as themselves.

Support for the notion of a new conception of self at the end of the first year comes from studies of imitation. Piaget (1962) suggested that it is not until stage 4 of the sensorimotor period, i.e. from around eight months of age, that infants imitate facial expressions, actions which they cannot see themselves perform. This Piaget argued is the earliest evidence of representation in infants. However, Moore and Meltzoff (1978) have challenged this position as they have found evidence of infants imitating facial gestures in the first few weeks of life and they argue that this shows that very young infants are capable of representation. Moore and Meltzoff go on to suggest that the increase in imitative activity that Piaget identified at the end of the first year indicates a new self-representative function by which the infant

"realizes that when he imitates another person,
*he looks like the other and the other looks
 like him*" (p.157, Moore and Meltzoff's italics)

However, this would require not only a new representation of self, but also of others.

The growth in understanding of personal agency intimately involves the distinction between self and others, not only in identifying agents, but also in having some expectation of their actions.

The infant has become aware that other people may have intentions that affect him. In normal circumstances his mother's reaction to each social situation may be important in creating values and attitudes about the infant's relationships to other people, indicating some to be close friends and others more distant acquaintances. The mother's absence means that the infant does not have her to give meaning to a new social situation and he may feel threatened by the uncertainty of his relationship with a strange person and by not knowing what behaviour to expect from that person.

This interpretation of infant fear of strangers is supported by the suggestion that from about ten months of age, other persons' interpretations of a situation can affect an infant's response to it. Infants have been found to use social referencing adopting the mother's response when strangers are present or when handling unusual objects (Lewis and Feiring, 1981 and Feinman, 1982).

Further developments in understanding the social world by taking on the attitudes of other persons are apparent in the second year of life when children have been found to be concerned with deviations from standards presumed to be disapproved of by adults.

Kagan (1981 and 1982) discusses the attention that children from eighteen months of age pay to damaged toys or objects like clothing or furniture and the sensitivity they show to parental prohibitions and having dirty hands or clothes. Such findings confirm that the infants perceive and place value on the mothers' intentions as expressed in their actions and communications and use these to guide their own actions.

10.5 THE ROLE OF COOPERATION IN HUMAN LEARNING

In growing up the human infant has several ways of learning about the world he lives in. He depends to some extent on imitating the actions of others and on experiencing the consequences, both social and physical, of his actions. Theories advancing these forms of learning have emphasised the important effect of other people on the infant's learning, yet they have failed to take account of the attempts that the infant himself makes in trying to understand and communicate and have not considered that from the end of the first year he may engage in cooperative action and use this as a means of learning about his world. While in order to communicate the infant requires that other persons make attempts to understand his actions and give feedback on them by replying appropriately, it is not the adult's interpretation alone that is responsible for inducing change in the infant's understanding of other people. Of critical importance appears to be his own receptivity to other people's actions and responses. It is apparent from this study that these theoretical explanations have not addressed the issue of the necessary two-way communication in "social conditioning", "observational learning" and "interpretation by adults" and that the phenomena they claim to explain require to be reformulated in intersubjective terms that recognise the developing child's conception of his own actions, interests and emotions and those of other persons.

In theories about human evolution, the development of the opposable thumb, bipedalism and increased intellectual abilities are considered turning points in human prehistory as they allowed our

ancestors to begin making and using tools on which survival came to depend (Mayr, 1963 and Young, 1962). In contemporary human infancy the beginnings of tool-use, i.e. handling objects in a manner defined by their functions, occurs at the same time as infants cooperate with other people. It appears that these two important human psychological characteristics, an ability to manipulate intelligently and a cooperative awareness, are intimately interrelated. The earliest form of communication about the world centres about the use of hands both in demonstrating ideas about objects and in gesturing a greeting or a request for assistance from another person.

While it is only possible to conjecture about the relationship between tool-use and communication in evolutionary history, it seems likely that tool-use alone cannot explain the particular evolution of man, but that cooperation about tool-use may have been a critical development. Barnett (1973) has suggested a new name for man, "homo docens" (man the teacher), drawing attention to the fact that teaching is a distinctive and pervasive human characteristic necessary for survival as culture (clothing, shelter, food preparation, courting, etc.) is transmitted by one generation passing experience and skills to another. The prolonged period of immaturity in human ontogeny characterised by play and close involvement with adults in instructional interactions (Bruner, 1972) is clearly essential for successful mastery of cultural practices.

It appears that at the end of the first year of life there is an

important development in the preparedness of the human infant to begin learning from other people about his social and physical world. He becomes both responsive to instruction and also able to direct another person's agency through which he can further explore the significance of objects and events. So his inter-subjective motives for cooperation apparently make him both a willing and active pupil and he starts to improve and embellish ideas about the world by sharing them with others.

APPENDIX A. CATEGORIES FOR CODING THE COMMUNICATION OF MOTHERS AND INFANTS

Note: (M) refers to actions used by mothers only, (I) to actions used by infants only and (M + I) to actions performed by either.

1. COMMUNICATIVE ACTIONS ABOUT OBJECTS

Group 1: Takes up the other's interest

1. *Follows in manipulation* - Grasps or touches an object which the other is handling or has been handling immediately before (M + I)
2. *Takes spontaneously* - Removes object from other's hand without it having been offered (M + I)
3. *Takes* - Following the mother offering an object, the infant takes it (I)
4. *Reaches other's activity* - The infant leans and reaches to a toy the mother is handling out of reach of the infant (I)
5. *Manipulates to follow interest* - Mother handles the object which the infant is looking at but not touching (M)
6. *Shows interest* - Mother leans forwards looking at what infant is doing (M)

Group 2: Controls and resists the other's action

7. *Regulates object for own purpose* - Acts on the toy which the other is handling, trying to assume control of it and uses the toy in a manner unrelated to the other's activity (M + I)
8. *Regulates to assist* - Acts on the toy which the other is handling, trying to assume control of it and uses it to perform a similar action to that which the other had been trying to perform (M)
9. *Imposes an action* - The mother moves the baby's arm and hand to perform an action on an object (M)
10. *Refuses* - Following the mother's attempt to regulate or impose the infant drops the toy to resist the mother's control (I)

11. *Removes hand* - Pushes away the partner's hand to gain access to the toys or to clear a space (M + I)
12. *Withdraws object* - Following or in anticipation of the mother's attempt to regulate or impose the infant holds toy away from the mother (I)
13. *Restrains* - During infant's vigorous activity the mother using gentle force tries to contain the infant's movements (M)

Group 3: Supports and accepts the other's action

14. *Assists* - By moving or holding objects, the mother helps the infant to continue or complete an action (M)
15. *Completes action* - Mother performs action that infant has tried but failed to perform herself (M)
16. *Anticipates action* - By following infant's interest the mother expects the infant to perform a particular action and moves the toys to match this expectation (M)
17. *Structures toys for infant's purpose* - Mother changes the arrangement of toys so that the infant on handling them will be likely to perform a transformation that the infant had clearly been trying to perform but was unable to achieve. There is no attempt to direct the infant's action, so the infant in performing the transformation is not following the other's instruction or accepting her assistance, but only following in manipulation (M)
18. *Structures toys for own purpose* - Similar to 16 above but this time the mother is arranging the toys for a transformation of her own choosing and not an action the infant was trying to perform (M)
19. *Accepts assistance* - The infant completes an action which the mother is assisting. The infant's activity is interrupted while the mother arranges the objects (I)
20. *Acquiesces* - The baby does not resist the mother's attempt to impose an action and contributes to that action (I)
21. *Releases* - Gives up a toy that the partner has been trying to regulate or take, so giving the other sole possession (M + I)

Group 4: Directs other's attention and follows attention

22. *Performs object display* - Taps, rattles or moves a toy to create an interesting event with a toy the other is already looking at (M + I)
23. *Object approach and retreat* - Moves toy nearer infant and then away. Often the action is dramatised by erratic or rhythmic movement (M)
24. *Hides and reveals object* - Conceals a toy from the infant's view generally holding it under the table and often tapping it when hidden, then shows the toy (M)
25. *Seeks* - The infant searches for the toy, leaning or stretching and reaching to find it in response to 24 (I)
26. *Provokes using object* - Infant performs an action with an object aimed at eliciting a controlling reaction from the mother (I)
27. *Touches with object* - Touches part of the other's body with a toy (M + I)
28. *Changes configuration* - Mother alters arrangement of toys illustrating their possible relations, but does not try to get the infant to perform a particular action (M)
29. *Makes toy available* - Mother brings object into infant's reach often renouncing control of it (M)
30. *Offers object* - Holds out an object to the infant and persists to encourage taking or does not resist when the other takes (M)
31. *Gives spontaneously* - Puts object into other's hand or mouth without request (M + I)
32. *Indicates an object* - Taps, moves, shows or touches an object which the other is not looking at in an attempt to direct the other's attention to it (M + I)
33. *Indicates distant object* - The infant leans and reaches with one or both hands towards an object out of reach indicating her interest in the object. The infant is not trying to reach the object for herself as she is not at full stretch (I)
34. *Points to object* - With index finger extended indicates an object (M + I)
35. *Points to own activity* - With index finger extended indicates own activity on object (M + I)

- 36. *Points to other's activity* - With index finger extended indicates other's activity on object (M + I).
- 37. *Follows point* - Looks in direction indicated by other's point (M + I).
- 38. *Follows gaze* - Moves head and/or eyes to look in same direction as other (M + I).

Group 5: Demonstrates and imitates

- 39. *Demonstrates* - The mother having attracted the infant's attention acts to show a transformation of objects that she wants the infant to copy (M).
- 40. *Imitates praxic action* - Immediately following the partner, performs a similar action with objects sometimes in response to 39 (M + I).
- 41. *Mimes demonstration* - The mother performs an action with an imaginary object, wanting the infant to perform that action on a real object (M).
- 42. *Imitates mimed action* - Immediately following the mother's mimed demonstration the infant performs a similar action on an object (I).
- 43. *Repeats imposed action* - Immediately following the mother's imposition of an action on an object, the infant performs a similar action spontaneously (I).

Group 6: Gives directives and complies with directives

- 44. *Indicates a locus* - The mother points or touches to draw attention to the inside of a receptacle in an attempt to get the infant to place there an object she is already holding (M).
- 45. *Indicates a further object* - The mother points or touches to draw attention to a toy in an attempt to get the infant to repeat an action she has just performed, placing a toy inside a receptacle, with another object (M).
- 46. *Indicates an action with an object* - By gestures one person tries to get another to perform a particular action with objects other than those described in categories 44 and 45 (M + I).

47. *Demonstrates and invites imitation* - Following her demonstration of a praxic action, the mother holds out a toy to the infant suggesting that the infant copy the action (M)
48. *Invites imitation* - The mother reacts to an action of the infant's and the infant then holds out the toy for the mother to perform a similar action (I)
49. *Offers object* - Infant holds out object to the mother and persists to encourage taking (I)
50. *Asks* - The mother holds out her hand for an object to be placed in it before the infant offers the object (M)
51. *Complies* - Acts according to other's directive immediately following the directive (M + I)

2. PERSON PLAY

52. *Performs hand display* - Moves arms or hands to create an interesting or attractive activity for the other to watch, e.g. claps, waves, raises arms, taps table (M + I)
53. *Hand approach and retreat* - Moves hands dramatically towards the infant and then away (M)
54. *Hand approach and touch* - Moves hands dramatically towards the infant and then touches the infant's hand, body or face (M)
55. *Hides and reveals hand* - Having attracted attention to her hand, the mother then hides it under the table and shows it again often in another place (M)
56. *Performs hidden event* - With her hand hidden under the table, the mother taps or scratches to attract or keep the infant's attention. This is often combined with hiding and revealing the hand (M)
57. *Performs face or voice display* - Pulls face or makes unusual non-speech vocalisation creating an interesting or attractive event for the other, e.g. pretends to sneeze or blows raspberries (M + I)
58. *Hides and reveals face* - Hides own or partner's face behind own hands or a tissue and then reveals face again (M + I)

59. *Provokes* - Infant performs a hand, face or voice display aimed at eliciting a controlling reaction from the mother (I)
60. *Acts on body or hand* - Playful actions on the other's body or hand, e.g. tickling, poking, biting or finger walking across body (M + I)
61. *Acts on face* - Playful actions on the other's face and head, e.g. stroking, blowing, rubbing noses, biting (M + I)
62. *Touches hand* - Touches or grasps other's hand (M + I)
63. *Touches moving hand* - The infant touches or grasps the mother's hand as she moved it in play or playfully touched the infant
64. *Imposes a body action* - Moves other's hand to perform an action, e.g. clapping other's hands together or wagging other's finger (M + I)
65. *Withdraws* - Pulls own hand or face away from touching or imposing by the other (M + I)
66. *Resists* - Pushes away other's hand or makes other attempts against imposition or touching (M + I)
67. *Assists other's action on self* - Infant spontaneously adopts appropriate posture to allow mother to perform an action of touching or imposition, or performs appropriate action to complete mother's activity (I)
68. *Body or hand imitation* - Immediately following the other, performs a similar action with hand or body (M + I)
69. *Face imitation* - Immediately following the other, performs a similar action with own face (M + I)
70. *Voice imitation* - Immediately following the other, makes a similar vocalisation (M + I)
71. *Indicates other's display* - By gestures one person tries to get the other to perform a particular demonstrative action (M + I)
72. *Indicates other's action on self* - By gestures one person tries to get other to touch in a particular way or impose an action (M + I)
73. *Indicates own action on other* - By gestures one person shows the partner what actions he will perform on the partner (I)

- 74. *Demonstrates and invites imitation* - Following her demonstration of an action to display or touch or control the infant, the mother points to the infant or holds out her hands to the infant suggesting that the infant copy the action (M)
- 75. *Invites imitation* - Following her action on the mother the infant presents her hands or face to the mother for the mother to perform a similar action on the infant (I)
- 76. *Complies* - Acts according to the other's directives immediately after directive is given (M + I)

3. PERSONAL ATTENTION AND EMOTIONAL EXPRESSION

- 77. *Smiles* - This is recognised intuitively. No attempt is made to define the facial movements (M + I)
- 78. *Laughs* - As for "smiles". Laughter includes vocalisation absent from smiling (M + I)
- 79. *Looks at the mother's face* - Infant directs gaze to the mother's face, and mother returns a look by the infant. (Note - mothers continually shifted their gaze between the infant's face and their joint activity. For the purpose of analysing the interaction, only those instances are included where the mother is returning the infant's gaze by looking at the infant's face either before or after the infant turned her gaze towards the mother) (M + I)
- 80. *Leans towards infant* - Looking at the infant's face, the mother leans towards the infant in a deliberate attempt to take over the baby's attention (M)
- 81. *Reaches towards mother* - The infant leans to the mother with arms reaching out (I)
- 82. *Complains* - The infant makes distressed face and vocalisations (I)
- 83. *Comforts* - The mother holds the infant close to herself and may kiss the infant (M)
- 84. *Disgust* - The mother makes a disgusted facial expression. This is recognised intuitively and no attempt is made to define the facial movements (M)
- 85. *Vocal negation* - The mother sternly says "No", sometimes accompanied by head shaking, to stop infant's activity (M)

APPENDIX B. CATEGORIES OF COMMUNICATIVE ACTION COMPARED WITH
THOSE DEFINED IN OTHER STUDIES OF MOTHER-INFANT
COMMUNICATION

1. COMMUNICATIONS ABOUT OBJECTS

Group 1: Takes up other's interest - These are actions taking up the object of the partner's interest or action and manipulating it in a manner distinct from and irrelevant to the partner's action.

This kind of communicative act has been little studied in the literature on mother-infant interaction. Murphy and Messer (1977) described the mothers pointing to a toy the infant is already looking at. Taking has been studied in the context of give and take routines and has been described as being dependent on the toy being offered or requested (Bruner, 1977; Gray, 1978 and Clark, 1978). However in this study it was found that both mothers and infants on several occasions spontaneously took an unoffered object from the partner.

Group 2: Controls and resists the other's action - This group includes all actions aimed at changing the other's behaviour by force and covers actions both to coerce the partner to perform a particular act as well as those to counter the partner's intervention.

Hostility and aggression in children have frequently been studied (Manning et al, 1980; McGrew, 1971 and Grant, 1969). However psychologists studying mother-infant interaction have not paid much attention to negativity and conflict, with the exception of negative expression towards strangers which has been widely investigated (Ainsworth, 1963; Schaffer, 1966; Schaffer and Emerson, 1964; Gewirtz, 1972; Spitz, 1950 and

Lewis and Rosenblum, 1974). Studies investigating negativity in the relations between mother and infant include Sylvester-Bradley (1980), Murray (1980) and Tronick et al (1978) who have discussed evidence of infants in the first six months showing visual avoidance of their mothers. Spitz (1957) described negativity in the behaviour of infants aged fifteen months. While family violence has recently become an important area for work (Kempe and Kempe, 1978) such a socially acceptable form of maternal aggression as teasing has been considered rarely (Trevvarthen and Hubley, 1978; Trevvarthen, 1979; Aldis, 1975 and Bretherton and Bates, 1979). Also rare are studies looking at maternal rejection, interference and insensitivity as well as acceptance, cooperation and sensitivity in non-pathological mother-infant relationships (Ainsworth, Bell and Stayton, 1974).

While the intention was not to investigate emotional or psychodynamic aspects of the mother-infant relationship, it was nonetheless found in this study that coercion, negativity and resistance were important elements in the regulation of joint action and these behaviours were used by both mothers and infants. Kaye (1977) in his study of mothers teaching their six month old infants found one of the strategies used was "hand tugging" which is equivalent to the category "imposes" described in this study.

Group 3: Supports and accepts other's action - This group includes actions joining in with the partner's activity in order to help and those conceding to the partner's intervention be it supportive or in opposition.

Whiten (1977) uses a category termed "assists" which he describes as the mother "helping the infant towards his own goal as inferred by the mother" (p.419). In this study there are four categories in group 3 and one each in groups 2 and 6 which are covered by Whiten's definition. Group 3 helping actions

("assists", "anticipates act", "completes act" and "structures for infant's purpose") are all unsolicited and show the mother joining in with what she believes to be the infant's plan.

The helping action of group 2, "regulates to assist", involves the mother physically controlling the infant's activity, while in the group 6 action the mother is responding to a specific request for help from the infant.

"Creates possibilities" is another category defined by Whiten (1977) and refers to "manipulations whereby the mother enhances the infant's scope for acting on objects" (p.419). He points out that in many cases it is clear that a particular outcome is expected. Such behaviours are similar to "mother structures for own purpose" which was also included in group 3. In these actions the mother deliberately made it easier for the infant to perform an action that the mother herself desired. By arranging the toys so that the infant on handling them would be likely to perform the desired action, the mother might have created the circumstances for the infant to discover a relationship between them through her own action.

Group 4: Directs other's attention and follows attention -

All the actions in this group are concerned with establishing joint interest, involving both attempts to direct the other's attention and those to follow the other's direction of attention.

In his study of mothers teaching a praxic action to their infants Kaye (1977) described the mothers "marking" a toy to attract the infant's attention to it. This category is termed "indicates object" in the present study and was used by infants as well as mothers. In addition in this study a category of "infant indicates distant object" was used. All the instances of this action consisted of an infant reaching to toys on the cupboard behind the mother and well out of the infant's reach, about six feet away. The infants were not trying to reach the toys for themselves as they did not stretch out. Nor were they

trying to get the mothers to give the toys as the infants did not show persistence or use other communicative actions to induce them to give the toys. The infants appeared to be trying to share their interest in the toys. These actions are related to infant pointing described by Bates (1976). In addition maternal pointing and infants following pointing has been studied by Murphy and Messer (1977) and infant "follows gaze" has been examined by Scaife and Bruner (1975) and Churcher and Scaife (1982).

Illingworth (1980) includes the item "repeats performance laughed at" in his developmental assessment procedures. These behaviours are similar to two categories in this study "performs object display" and "provokes" which are distinguished by the form of the maternal response that the infant seems to expect. Smiling, watching and vocalising are appropriate in response to a performance, whereas provocation was reacted to by the mothers trying to discourage or stop the infant acting in this manner. When using "provokes" the infant was teasing the mother by playfully opposing her wishes.

Two particular types of display using objects performed by the mothers were common and so were distinguished as separate categories. These are "object approach and retreat" and "hides and reveals object". "Seeks object", the appropriate infant reply to the second of these displays, is well documented in infants aged eight months and over (Piaget, 1953; Uzgiris, 1976).

A category of actions used by the mother, "changes configuration", is related to "performs object display". The important distinction between these two categories is that in the latter the mother created an exciting, noisy or lively event, whereas in the former the mother acted to illustrate the relationship between different toys, assembling them in various combinations.

While Bruner (1977) and Gray (1978) describe behaviour categorised as mother "gives spontaneously" by placing a toy in the infant's hand, in this study infants too performed these types of action. These are not classified as directives as the toys were placed in the partner's hand or mouth without waiting for an action denoting acceptance and are distinguished from "offers objects" in which the infant holds out a toy inviting the mother to take and waits until she does so.

Group 5: Demonstrates and imitates - In this group were included demonstrations not combined with directives to imitate and imitations made without an explicit invitation to do so.

Kaye (1977) found that demonstration was a common action for mothers teaching their infants a task, Whiten (1977) described a category of mother "demonstrates" which "comprised those acts which the infant was intended to imitate" (p.419). This definition covers two categories used in this study where the distinction was made between demonstration of an action the mother wanted the infant to copy ("demonstrates") and a similar demonstration followed by an explicit directive to imitate ("demonstrates and invites imitation"). Infant imitations of the latter were not classified as "imitates", but as "complies" as the infant was following the mother's explicit directives. "Demonstrates and invites imitation" and their compliant replies were classified in group 6 below.

Pawlby (1977) studied imitation in the interactions of mothers and their infants aged seventeen to forty-three weeks. Her study looked in close detail at the particular activities imitated and one of the groupings she used in classifying them was similar to that of "imitates praxic action" used in this study. It is not clear from Pawlby's account how imitation was defined. However in the present study only those instances were so categorised in which one partner performed a closely similar action

immediately following the model with no intervening action by either mother or infant. Consequently problems of identifying delayed or deferred imitation were eliminated.

A different type of imitation was also included. In "repeats imposed action" the infant immediately following the mother's imposition performed a similar action voluntarily. Maratos (1973) in her study of imitation in the first six months of life also described imitation of kinaesthetic models in which the infant repeats a passive movement imposed upon him.

Group 6 - Gives directives and complies with directives -

This group comprised all gestures that specify the partner's action and those actions that are made in response to such specification by the partner.

"Mother asks for an object" and "infant gives on request" have been studied by Bruner (1977) and Clark (1978). Apart from behaviour in these give and take routines, no examples were found in the psychological literature of behavioural categories of gestured directives by adults and their obedience by infants. Studies of pre-language communication have concentrated on the infant's directives to the adult and investigations of infant comprehension have looked exclusively at linguistic not gestured communication (de Villiers and de Villiers, 1978; Snow and Ferguson, 1977 and Menyuk, 1974).

Infant "offers object" and maternal compliance in taking the toy have been reported by Bruner (1977) and Clark (1978). Bates (1976) has described infants at the end of the first year directing the action of adults non-verbally, e.g. getting the mother to continue speaking into a telephone receiver. In his study of protolanguage, Halliday (1975) describes his son Nigel from the age of 9 months using specific vocal expressions for demanding an object and commanding an action (called by Halliday the "instrumental" and "regulatory" functions respectively).

In describing categories for his speech act analysis of adult utterances, Searle (1975) included a category termed "directives". Giving some infant actions the same category label was done independently of Searle's work and does not indicate that they have any particular relationship to the adult utterances so named.

2. PERSON PLAY

Several researchers have used similar categories to those found in this study. Bates (1976) described "showing off" by blowing "raspberries" which is similar to performing facial, vocal and hand displays. Sroufe and Wunsch (1972) got mothers to perform play items similar to "hand approach and retreat" combined with "touches body or hand". Several of their tactile and auditory play items are comparable to the definitions given in this study of "touches face" and "performs facial or vocal display" respectively. "Hides and reveals face" has been described by Bruner and Sherwood (1976) and Aldis (1975) and is used in four of Sroufe and Wunsch's (1972) play items. Pawlby (1977) used categories of imitation exactly equivalent to those given in Appendix A, i.e. "body", "facial" and "vocal", except she distinguished between speech and non-speech sounds, whereas in this study they were combined in one category of vocal imitation.

3. PERSONAL ATTENTION AND EMOTIONAL EXPRESSION

Young infants looking at the mother's face has been studied by many psychologists including Wolff (1963), Jaffe et al (1973), Stern (1974a, 1974b and 1977) and Murray (1980) and several of these authors also investigated the mother looking at the infant's face. Studies of infants towards the end of the first year have described interpersonal gaze in combination with other communicative actions, e.g. Bruner (1975 and 1976), Bates (1976) and Clark (1978).

The muscle movements in the emotional expressions of smiling, laughter, distress and disgust have been identified in studies of adults by Ekman and Friesen (1975 and 1978) and in infants by Oster and Ekman (1977) and Oster (1978). This study did not use detailed examination of muscle movements to distinguish facial expressions, but relied on intuitive recognition by the investigator. This approach has been adopted by other researchers, e.g. Sroufe and Wunsch (1972), Sroufe and Waters (1976) and Whiten (1977).

APPENDIX C. SAMPLE CODED TRANSCRIPT OF FIFTY SECONDS OF A SESSION (ANN AT FIFTY WEEKS WITH HER MOTHER)

Mother's Behaviour				Time		Infant's Behaviour			
Coding	Speech	Manipulations and Gestures	Gaze	M i n	S e c	Gaze	Manipulations and Gestures	Vocn	Coding
1.1	Offers	That's right		56	00	G+Y in M's hand			
	Indicates a locus	Put that one in	Offers G Points into T			Man O+M Man O	Takes G Puts G into T		Takes 1.2
			Man B	56	05				
		Oh you're going to take it out again	B's face Man B B's face				Takes G out of T Takes R out of T		
				56	10		Drops G		
2.1	Indicates a locus	Put it in	Taps in T	Man B Man O Man B		Man M T Man O T	Handles G+R on table Puts R into T		Complies 2.2
		That's a good girl			56	15			
2.3		Put the other one in	Grasps G	Man O		Man M			
	Indicates a further object	Put that one in	Offers G	B's face Man B Man O+B		Man O+M Man O	Takes G Puts G into T Hits G in T		Takes 2.4 Complies
		That's a clever girl			56	20			
2.5	Indicates a further object	You don't have to kill them when you put them in	Offers Y	B's face		Man M Man O+M	Takes G		Takes 2.6
		You can just put them in gently				Room Man O	Holds G		
					56	25			
3.1	Indicates a locus	Put that one in	Points into T	Man O B's face Man B B's face Man B			Puts G into T		Complies 3.2
		That's lovely				TGY+R	Settles G in T		
					56	30			
	Leans to B, smiles	That's a good girl	Clap hands Leans to B, smiles	B's face					
		Will you take them out again? Good	Sits back	Man B B's face		Man O TY+R	Takes G out of T Holds G		
					56	35			
4.1	Manipulates to follow interest	One	Take Y out of T	Man O		Man M			
	Offers	Two	Offers Y	B's face		Man O+M Man M	Takes Y Holds Y		Takes 4.2
		Three	Takes R out of T onto table	Man O		R			
					56	40			

T = Truck Y = Yellow figure R = Red figure G = Green figure M = Mother B = Baby O = Own (act on part of body)
 Man = Manipulation Vocn = Vocalisation

Vertical bars on left indicate communication sequences 1 to 4
 Numbers after point indicate acts or groups of acts by each partner

APPENDIX D. INTERVIEW SCHEDULE ADAPTED FROM THOMAS ET AL, 1963

Parental description of infant's personality

If a friend or relative who had never seen the baby asked you to describe his personality, what would you say?

Sleep

Time and regularity of bed-time and nap.

Does B go to sleep easily or not?

Is there any special ritual at bed-time?

Does B sleep through the night?

If awakened at night, what is the frequency, what is behaviour on wakening, and what is required to put B back to sleep?

What is response to any parental attempt to modify sleep pattern?

Does sleep pattern change with illness, teething or change of surroundings? If so, what was the change, and how quickly did it return to previous pattern when apparent cause of change disappeared?

What is B's response to being put to bed by different people?

What is behaviour on wakening after night's sleep or nap?

Feeding

Amount and regularity of food intake, response to new foods, consistency of likes and dislikes.

Does B attempt to feed himself? If so, what does he do and how persistent is he, and what is his reaction to M trying to feed him?

What is B's reaction to a new food?

How does B indicate hunger? and satiation?

What is B's response to interruption of feeding?

What is B's response to preparation before mealtime?

Is there difference in feeding pattern when fed by different people?

Soiling and wetting

Does B show any reaction to being wet or soiled? What does B do?

If B shows a characteristic reaction, when does this stop?

How many bowel movements does B have daily, are they regular and at regular times? Does B have any consistent reaction to passing or presence of stools?

Bathing

What is B's behaviour to preparation to bathing, e.g. hearing water running?

What is B's behaviour in bath?

Does he object to removal from bath-tub?

Was there any reaction to change in bath-tub or person bathing him? Does B try to wash himself? If so, what did he do, and what was his reaction to M bathing him?

What is reaction to hair washing?

What is the time relationship of bath to feeding? Was there any change in reaction to the bath if the time relationship to feeding was changed?

Nailcutting, hairbrushing, washing of face, nose, ears and hands

To each of these:

What is B's reaction

Does B attempt to do any of these things by himself? If so, how?

Does he request help? Does he accept help?

Doctor

Reaction to doctor and examination by doctor.

Description of immediate reaction to injection. How loud was cry, how long did it last, and what stopped it?

On later visits, was there any reaction to coming into doctor's room, seeing doctor, being undressed or placed on table prior to examination?

Dressing and undressing

Does B resist, cooperate, or do neither?

Does he resist being held still?

Does B attempt to dress himself? If so, when did he start, what does he do, and what is his reaction to M trying to dress him?

How persistent were his attempts (give details of actual behaviours)?

How did he respond to difficulties?

Sensory

How long does startle response persist?

What was the specific reaction?

Is B more responsive to one class of stimuli, e.g. visual or auditory?

What is B's reaction to pain?

Does sound or light easily disturb his sleep?

Is B active, moderate or quiet?

Descriptions of movement and posture during sleep.

Neuromuscular

When did new development occur, e.g. sitting, crawling, pulling to stand, walking?

Did mastery of ability come suddenly or after period of persistent effort? What was reaction to failure in effort at mastery? What was reaction when success was achieved?

Is a playpen used? If so, what is B's reaction to being put into it, how long does he stay in it, and how does B indicate wish to get out?

Response to people

What is the reaction to strangers? Does B take the initiative, respond quickly to a stranger's initiatives, require a period of warming up, or show a general negative reaction?

Does B show any special responses to particular people, familiar or strange?

What are B's responses to the various members of the family?

What happens when one or both parents leave B in care of someone else?

Does B show affection to members of the family?

Response to new places

What is B's reaction to being in a strange place?

Response to illness

The specific changes in behaviour during illness.

Did behaviour return to pre-illness pattern immediately after illness was over? If not, what differences persisted and for how long?

Play

How long does B play alone? How long does B concentrate on one toy or game?

What are B's favourite toys?

Does B take to a new toy or game with people quickly, or does he prefer the more familiar toys and games?

When during the day does B usually play? Are these social or solitary play sessions?

What games does B play with adults? What is B's behaviour during the games?

Does B play with other children? If so, how do they play together?

Does B start games? If so, describe what B does.

Learning of Limits

What is B's response to a parental "No"? When did B start responding to "No"?

How quickly and easily was B trained to avoid a prohibited item or activity?

If forcibly moved from an item or activity, how does B react?

How easily can B be distracted?

Verbalizations

How much does B babble and when during the day?

Does B say any words yet?

How much does B use sounds in social interactions and in solitary activities?

Does B have a characteristic way of calling for your attention? If so, describe.

Does B try to get you to do things for him?

Crying

What makes B cry? What makes him stop?

If he hurts himself, what is his crying pattern?

Haircut

Has B had a haircut? If so, what was his behaviour?

Omissions

Is there anything that should be mentioned about your baby's behaviour that has been omitted?

APPENDIX E A NOTE ON THE USE OF STATISTICS WITH FIVE SUBJECTS

A detailed study involving micro-analysis of the communication between mothers and infants was done. This approach precluded employing large numbers of subjects. Using only five subject pairs however has disadvantages for statistical treatment of results, since most tests require larger groups of subjects. Nonetheless, the statistical tests employed, principally Page's L Test and the Sign Test, do give probabilities for results calculated on five subjects only (Siegel, 1956).

These tests require that for a sample of five subjects every individual shows the same change in behaviour under equivalent conditions whereas with a larger group more variation between subjects is tolerated for a statistically significant result. Consequently behavioural trends which in this study with five subjects are not statistically significant, may be significant if a larger sample were used, and so some of the results reported in this thesis may in the light of future work appear to be conservative. To meet this disadvantage on occasions results that are not statistically significant are reported as it is considered that they may indicate an important trend that could be explored in further studies.

In reporting the results statistically significant behavioural changes are in all cases recorded and expected outcomes, which on analysis proved to be not statistically significant, are stated to be non-significant. At all times when the results of statistical tests are not given the results are not significant.

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9

Secondary Intersubjectivity: Confidence, Confiding and Acts of Meaning in the First Year

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INTRODUCTION

This paper examines a change in human communication which takes place about 40 weeks after birth, well before speech begins. Detailed film evidence favours the view that developments of brain functions at this time cause the infant to accept persons in a new way. The change is apparently not primarily a reflection of input from the social environment. It is, indeed, an active regulator of all experience, adapted to create a new form of communication that leads not only towards understanding of language but also to developments in the infant's ideas of objects. The infant's new reaction to persons is voluntary, not reflexive. It may be withheld when appropriate stimuli are present, and it tries to gain expression when circumstances are opposed to it.

A 1-year-old infant is extremely alert to stimuli from its own acts, whether arising from the manipulation of objects or from communication with persons. Moreover, mental activities at this age appear to be preadapted to relate these two different forms of experience, and to develop under their joint influence. The behaviour that starts at 9 months is a rudimentary outline of exceedingly complex cognizance-sharing acts of adults that we normally consider to be both consciously intended and bound by rules of cultural origin. For example, it includes prototypes of

pointing to an interesting event and addressing a comment on it to another, giving and taking with acknowledgement of the shared intention, and accepting a word as specifying a particular experience.

The mysterious, forward-looking, innate determination of psychic growth is here manifest in a most elaborate form. Indeed, psychological functions that remain central to the highest intellectual and moral achievements of adults in society are expressed in a 1-year-old on the threshold of spoken language. An accurate account of the intelligence of infants at the end of the first year must, therefore, specify elaborate features of their behaviour that are both uniquely human and directly concerned with the unself-centred sharing of initiative on which human society and its cultural evolution depend. Prelinguistic infants make acts of communication that show well-controlled grammatical forms adapted to speaking and the understanding of speech, but this is only one aspect of these acts. They are also adapted to non-linguistic forms of co-operative behaviour in which images and intentions are oriented to and specified for others by gesture and by the direction, rhythm and mood of purposeful movement.

The most important feature of the new behaviour at 9 months is, then, its systematically combining of interests of the infant in the physical, privately-known reality near him, and his acts of communication addressed to persons. A deliberately sought sharing of experiences about events and things is achieved for the first time. Before this, objects are perceived and used, and persons are communicated with—but these two kinds of intention are expressed separately. Infants under 9 months share themselves with others but not their knowledge or intentions about things.

In other papers, findings have been reported on Primary Intersubjectivity—the earliest form of interaction between the 2- to 3-month-old infant and persons, and its relation in the infant's mental life to interactions with objects (Trevathen, 1974a, b, 1977a, b, c). Here we shall present observations from a film and TV study with one baby girl, to show developments beyond 6 months. These and comparable findings on other infants will be related to what has been described by others for this period of infancy. The reader should understand that this is a preliminary account. The highly complex process we are concerned with will require more extensive and more exact treatment.

METHODS

We film infants with their mothers in a quiet room equipped with studio lighting, a TV camera and microphone. Black and white 16 mm cine films

are made with a telephoto lens from an adjacent darkened room through a window which isolates subjects from the observers. Each infant is supported in a specially designed seat which allows free movement of all limbs while the infant's trunk is firmly supported in a near vertical position. A front view of the infant is combined with a side view of the mother in a large mirror beside the baby. In biographical (i.e. longitudinal) studies, as described in this paper, both mother and infant become highly familiar with the recording room which is comfortably furnished and carpeted for sound recording. The mother is given no instructions apart from a simple request that she play with and talk to her infant.

The largest sample of behaviour is obtained on TV with sound. This record, carrying an electronic digital indication specifying the date and time to 1/100 second, is replayed to obtain a transcript of vocalizations and a running account of the behaviour of both partners. The smaller sample of the behaviour on film is subject to slow motion or frame-by-frame analysis on a specially constructed projection console using a Perceptoscope variable-speed projector with frame counter. Illustrative photographs are obtained by enlargement from the cine film and printed onto direct positive paper. Further details of our method are given in another paper (Trevathen, 1977a).

The tapes and films of the present study were viewed independently by both authors, and Mrs Hubley was present at all the recording sessions. Doubtful interpretations were subject to repeated examination until we reached agreement.

During her first year Tracey made 32 visits with her mother for video-recording and filming.

The First 6 Months

Tracey, a first infant, was induced with oxytocin at full term on 21 August 1973. Her mother had previous mild hypertension, was conscious during the birth, but afterwards was briefly anaesthetized for removal of the placenta. There were no complications and they were discharged on Tracey's sixth day. The mother, married to a medical statistician, was then 25 years of age and had been studying for two years at teacher training college. Both parents had university qualifications. Tracey's birth was unplanned and caused her mother, who had just qualified as a nursery school teacher, to give up her intention to begin work.

Details of Tracey's behaviour with her mother during her first 6 months

are reported in the Appendix. The following is a summary of the main changes in her reactions to objects and to her mother.

At 1 month Tracey made active stereotyped pre-reaching movements aimed to a coloured ball suspended in front of her. She tracked the ball attentively with her eyes and adjusted the aim of her rudimentary reaching (Trevvarthen and Hubley, in preparation). She also responded to her mother's baby talk by fixing her eyes on her mother's face, periodically cooing and making face expressions, including prespeech coupled with gesture-like movements of her hands. Her mother's speech was affectionate and it demonstrated a conceptual personification of Tracey's actions. The interchange was regulated by the reactions of both partners.

In her second and third month Tracey developed normally, showing interest in her surroundings and subtle communicative interactions of primary intersubjectivity (Trevvarthen, 1977c). However, while very alert and active she also showed a wariness with people. She frequently avoided her mother, withdrawing her gaze or pulling away from contact. This may have been a consequence of her mother's slight anxiety and lack of confidence during her pregnancy and through the early months after the birth. She said she feared Tracey, who was breast fed, was not getting enough milk. When Tracey was 11 to 15 weeks of age her mother felt too unsettled to attend the recording sessions and asked that we cancel them until she felt better.

In the fourth and fifth month, when her mother was much happier, Tracey was intently interested in objects and she quickly achieved controlled use of her arms and hands to grasp objects. Tracey also played games with her mother's hands and mouth (cf. Fig. 2). Hand and mouth play was picked up and developed by her mother and other partners.

At 21 weeks Tracey played with a familiar puppet which she watched as she made it move by pulling a cord (Fig. 1; cf. Fig. 4). She showed enjoyment at the effect she made, clearly expressing herself to her mother who held the toy. She also picked up objects offered to her, but made no attempt to give them back. Several times she pushed offered objects aside. She frequently held objects to her side, and dropped them (cf. Fig. 6), sometimes turning this into a joke shared with her mother by a look of amusement passed between them. Objects were incorporated in games by the mother who often touched Tracey with them playfully. Communication was most often mediated by way of play of this kind (cf. Fig. 4).

In her first 6 months Tracey not once handed an object to another person deliberately, nor did she do any other act that combined orientation to a person with her own use of an object. In games Tracey shared her enjoyment of the actions given by others to objects, but she did not separately acknowledge persons and she looked at her mother only after withdrawing completely her own interest in an object. Interest in objects and interest in

persons seemed to be conflicting. At 5 months Tracey was just beginning to accept a form of game in which an animated object was accepted both as a mediator of what her partner intended and a focus of Tracey's own interest for manipulation, etc. (cf. Fig. 4).

Tracey at 6 Months

We obtained 110 minutes of videotape and 25 minutes of film of Tracey at weeks 25, 26, 27 and 28. Tracey, seated in the infant chair, was either in front of her mother, or at a four foot square table covered with soft felt while her mother sat to one side. A half-circle was cut out of one side of the table to fit Tracey's waist, thus providing a surface for her to play with objects. During these weeks Tracey concentrated intently on the manipulation of objects of various sizes placed near her. As in previous weeks these included her favourite toys brought from home (Fig. 1).

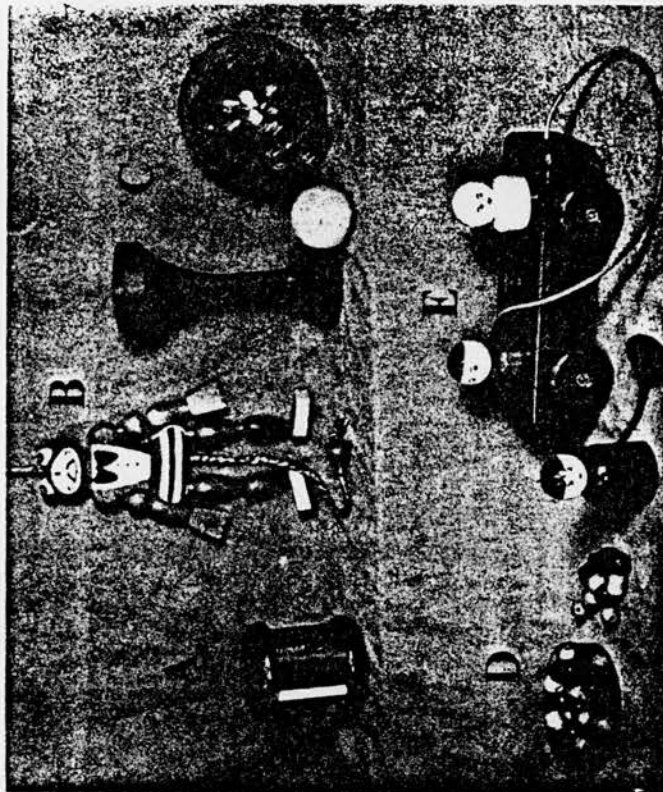


Fig. 1. Tracey's toys. (Tracey used a rabbit instead of the frog shown. All the toys are commercially available.)

When concentrating on objects Tracey was generally unsmiling, her brows relaxed or contracted to give her a puzzled expression, her upper lip slightly protruded and lower jaw relaxed. She also opened her mouth and oriented her lips when grasping or when bringing an object up to her mouth. Two-handed pulling-in of a suspended object to her mouth was less common than at 1 month previously. Tracey preferred to explore the effects of touching and moving objects under close visual attention, repeating regular cycles of the movements of touching, turning, displacing and releasing. When evidently less alert, or when tired, she watched her hands or feet while they moved slightly. This "hand-regard" or "foot-regard" was a separate function from the handling of objects monitored by vision.

With her mother, Tracey behaved as if self-possessed and contented, but, in contrast to her behaviour at 2 to 3 months, she refused direct face-to-face communication with sharing of mood. Often she looked away, avoiding eye contact (see Fig. 6). At the same time the two of them joined repeatedly in the two kinds of highly co-operative game mentioned above. The first of these used Tracey's marked interest in her mother's *person* as a goal for interest and a source of stimulating activity. The second obtained the same result through mediation of an *object* which thus became a toy, or vehicle of play.

Games of the Person (Fig. 2)

These involved a sharing of communicative intent. The mother captured Tracey's attention, not directly by confronting her, looking at her gently and following her smiles and eye-to-eye contact as in primary intersubjective exchanges, but indirectly by exaggeratedly moving her head in-and-out and by making emphatic face or mouth movements and strongly marked sounds of surprise. For example, she held her head back and opened her mouth widely three or four times in succession, making loud sounds of exclamation, or she put her finger in her mouth and pulled it out to make a "pop", or wiggled her nose. Her mother's hands, too, interested Tracey and they were moved in a rhythmically marked way in these interpersonal games. The mother offered an animated echo to Tracey's expression and excitement, simplifying and exaggerating acts that both recognized as forms of communication.

Tracey concentrated on and *imitated*, more or less faithfully, aspects of each kind of her mother's expressive activity. Most often, however, she replied in a reciprocal way with her own acts of animation; raising her eyebrows, smiling, gesturing or posturing and laughing. Usually she looked away for a moment as she did so. The details of these exchanges demonstrate

how a partner in a game must adjust her behaviour closely and appropriately to the baby's signs of interest and enjoyment which have a high degree of self-determination. Occasionally, after looking back several times and exciting her mother to more emphatic play, Tracey looked away and stopped smiling. At other times she rejected the initial solicitations and then the mother either waited for Tracey to look at her, or tried to catch her attention with an object and dropped personal play.

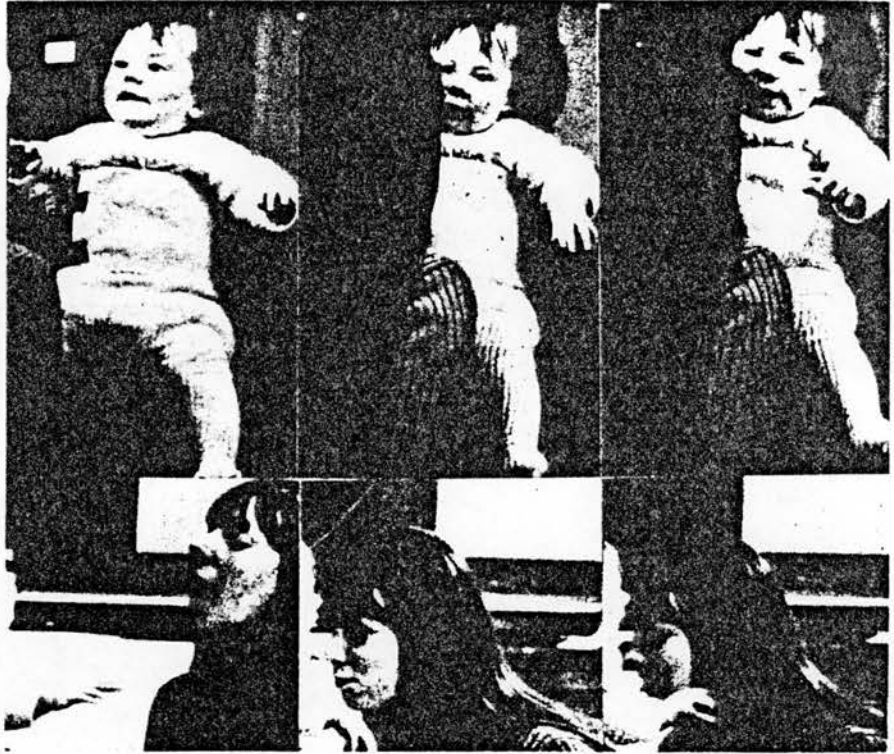
At the same time as Tracey imitated face expressions and hand movements, she also frequently reached to touch her mother's mouth or chin. In previous weeks Tracey had become very attentive to her partner's hands as well as to her face. It appeared that some differentiation of perception of the expressive parts of the body led to the formation of the games in which some of the mother's signals were ritualized to obtain a sharing of excitement and pleasure. Tracey's eagerness to reach for close objects combined with her attention to the face led to various hands-to-face games. Tracey was not seen to reach for her mother's eyes as many babies do at this age. She also tended to look solemnly at people with a "searching look" (Kris, cited by Mahler, 1963, p. 313) or to avoid eye contact. Her interest in hands led the mother to hold up an extended index finger for her to grasp and pull at or chew. Movement of the finger or nose or mouth in her grasp could trigger her laughter immediately. Incidentally, this game illustrates how the essence of an infantile "joke" lies in the sharing of pattern and coincidence in intentionality, i.e. the formation of a climax or paradox in mutual intentionality.

Voice games, profiting from Tracey's interest in her own sounds formed an important source for interpersonal play, with the advantage of permitting play with someone not being watched. Usually, however, her sounds and the mother's speech were part of a complex of expression and coupled to head and body movements, gestures and grimaces, all of which reinforced the communication.

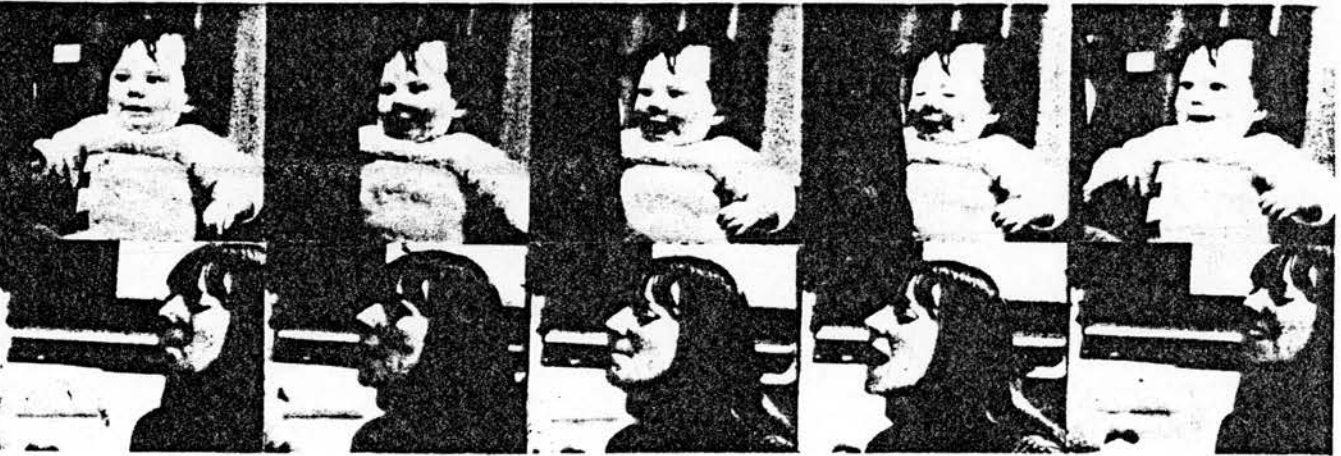
Tracey showed normal development of vocalization, making either excited shouts, crying and laughter, or more subtly modulated trains of hooting or cooing which rose and fell in intonation to create "utterances" that were fitted to concurrent gestures and manipulation of objects. The latter kind of declarative vocalization developed, at about 6 months, into rhythmic, syllabic babbling, made while Tracey was more calm, and often accompanied by concentrated play with objects. In our recordings she babbles infrequently, probably because the circumstances of our observation were not suited to private self-entertainment. However, Tracey did vocalize while playing with objects, and her play with the vocalizations that others made while they expressed themselves with visible movements of face and hands, appeared to follow this development.



(a)



(b)



(c)

Fig. 2. Games of the person; 25 weeks.
 (a) Tracey touches her mother's moving mouth, looks at it and imitates a protruded jaw.
 (b) Mother throws her head back, then rapidly to Tracey's chest, vocalizing. Baby turns away and smiles.
 (c) mother repeats plosive sounds, approaching baby's face. Baby replies.

After 16 weeks, when Tracey was making a grunting sound with her efforts at reaching, her mother increasingly used nonsense speech to engage Tracey's interest, and they played games in which the pattern of body movement (e.g. face or hand moved in and out to Tracey's face or stomach) was marked by nonsense sounds and by words sung with exaggerated rhythmic intonation (Fig. 2). The following extracts from the transcript at 25 weeks indicate the variety of her mother's sounds matched to touching of Tracey's body (cf. Sylvester-Bradley and Trevarthen, 1977).

Mother's Acts and Speech: Tracey 25 weeks old

- "Ma!" (widens eyes in mock surprise and moves her face towards Tracey)
 "Boo!" (leans forward almost touching Tracey's chest with her chin)
 "Beri beri, beri, Ba!" (leaning forward, smiling broadly on "Ba")
 "Ah—Phit!"
 "Ah—Phoo!" (approaches rapidly to touch Tracey's belly)
 "Whooo!"
 "Aber, aber, aber, aber." } (rising pitch, approaching)
 "Awer, awer, awer, awer, pit!" }
 "Amer, amer, amer, a mo!" (approaching, head bent low)
 "Aah, Tracey!" (taps Tracey and whistles)
 "Tch, tch, tch, tch" (looks aside and swings back, sounds in a crescendo)
 "Tic, tic, tic, tic, tic" (crescendo, tapping gently along Tracey's neck)

Games with Objects (Fig. 3)

In the month between Tracey's visits at 25 and 28 weeks she joined in games in which objects were animated by her mother (Fig. 3). Their function as foci for Tracey's visual interest was brought under her mother's control, this being subtly adjusted to Tracey's predictions of how the object would displace or make sounds, or how she would touch it. The same formula was observed as with games of the person, the object being endowed with repeated rhythmical cycles of motion, of change in proximity, direction or orientation, and caused to emit patterned successions of rattles, bangs, etc.

For example, the mother held up a toy and instead of handing it to Tracey either moved it in swoops or jumps to Tracey's face or chest and suddenly away, or made it "fly" from side to side above Tracey's head as she turned about to look at it and made gestures to reach for it (Fig. 5). The following vocal accompaniments occurred at 25 weeks:

- "Oh! Tickle!" (object suddenly down to Tracey's chest)
 "Thup!" (object touched on Tracey's nose)
 "Choo!" (catching ball dropped by Tracey)

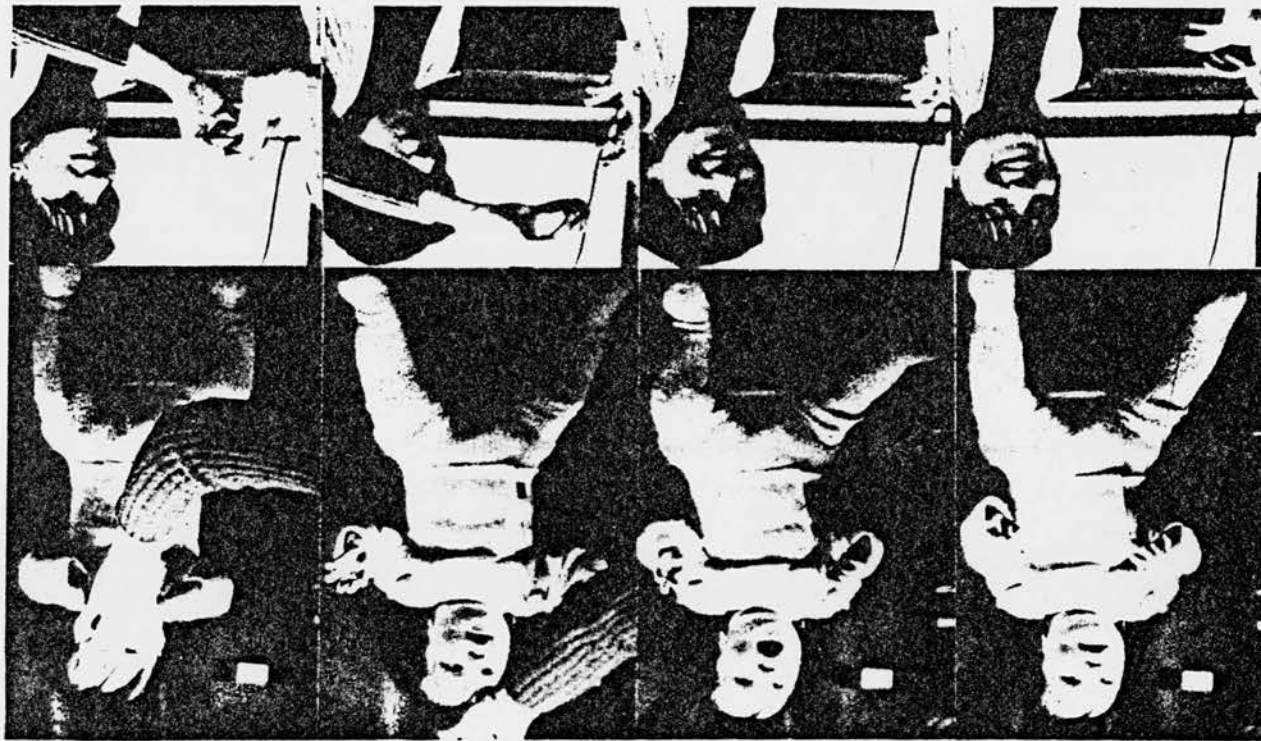


Fig. 3. Object animated by mother; 27 weeks. A wooden ball is carried up in the air then down towards Tracey's reaching hands.

"Up in the sky . . . Da ooh! Tickle!" (ball held and shaken while lifted for Tracey to track, then swooped down)

At 25 weeks Tracey was mostly seriously intent and unamused, but several times she "joined the fun" of play with an object and then smiled, vocalized and finally laughed and moved her body vigorously. Sometimes the "interest" of the game was more concentrated and subtle as the mother made an object produce a series of small movements while Tracey watched intently, unsmiling.

There was a definite gradient of obedience of the mother to Tracey's will. Sometimes the mother merely suspended a thing or placed it on the table passively, for Tracey to manipulate. Then there were excited games with the mother using formulae of progressively organized enjoyment geared to follow the pattern of Tracey's interest. Finally, there were times when they more equally shared intention, Tracey reflecting the action of the mother with changing expression and quite two- to three-syllable babbling sounds, but without smiling or looking at her mother's face. In this sharing kind of play Tracey allowed the mother's inventions to create her experience and did not try to take over herself. This is a foretaste of co-operation to be fully achieved only 4 months later.

All these games were created out of Tracey's interest in the effects of her own and her mother's action on objects. Though motivated by her pleasure in achieving perceptual mastery, they were inside an interpersonal framework. As with games of the person, Tracey co-operated closely with her mother, but she did so without giving more than an occasional glance to her mother's eyes and without looking at her mother's expressions to observe feelings or interest concerning herself. She appeared unable to attend to the other's purpose directly, or else resistant to it.

Both kinds of game appeared to grow out of the touching, sound-making and object-presenting of her mother that we saw when Tracey was 4 or 5 months of age. Even though the mother's adaptations were undoubtedly influenced by knowledge and ideas imported from her cultural experience away from Tracey, the strong regulation of the play by Tracey's acts makes it unlikely that the games were invented by the mother. The games appear to follow development in the object-seeking and person-recognizing functions Tracey has exhibited since her first month, and to depend on the mother being interested and sufficiently aware to adapt to these functions.

What the Mother Says about Tracey

In the sixth and seventh month Tracey was perceived by her mother to be wilful, intensely interested in exploring objects and disinterested in inter-

personal communication for its own sake, but able to join happily in games. Detailed evidence about these perceptions came from what the mother said to Tracey while they played together.

She made humorous nonsense sounds, word games sometimes charged with mock anger and surprise as well as fun, and exclamations of delight or laughter. A further striking feature of the mother's language was her use of *questioning*. She repeatedly asked if Tracey did not want to do things, or if she would respond to her. Often she pleaded. She said, "Come on, can I have it back?" after handing Tracey an object. Tracey, in this instance, as in all others at this age, did not give the object back. Her mother took it, or caught it when Tracey dropped it, saying "Thank you". In handing an object to Tracey she said, "Do you want it? Here you are then." The verbal and non-verbal utterances of the mother were distinctly different from her talk to Tracey at 1 or 2 months (see Appendix), reflecting her attempts to respond to Tracey's clear signs of changing interest in and use of surroundings.

Inverting the Game with a Toy (Figs 4 and 5)

At 27, 28 and 32 weeks Tracey's mastery of games with toys shows a complex inversion of roles with her mother. Tracey at this age practised "secondary circular reactions", e.g. shaking and banging objects she was holding. When she shook a cage with a bell in it, her mother, looking at Tracey, synchronized her head with the movement and the sound. This caused Tracey to pause and "think". As soon as she moved again her mother moved her head in synchrony saying, "Bang, bang, bang!" Tracey watched her mother closely and the effect became a game, leading to eager smiling and laughter. Then the mother made Tracey laugh heartily by zooming the toy to Tracey's



Fig. 4. Object-person games.
(a) Tracey pulls puppet string, watching mother's face and smiling; 27 weeks (Fig. 1B).

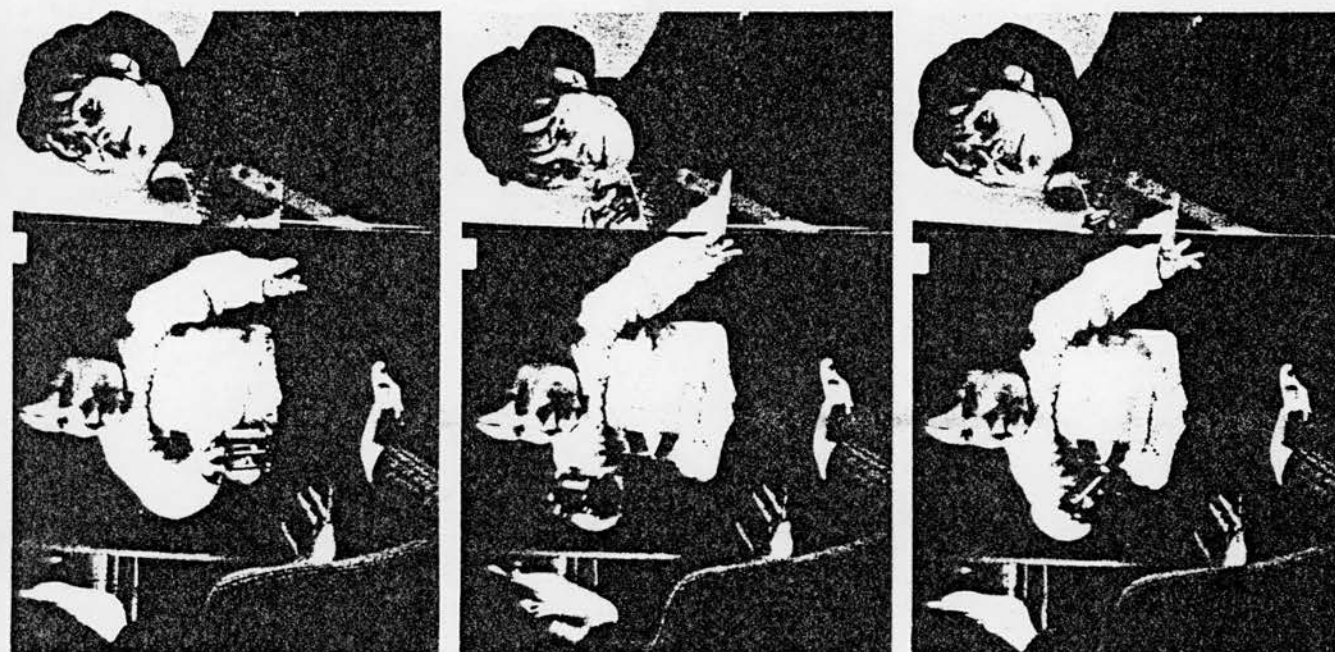
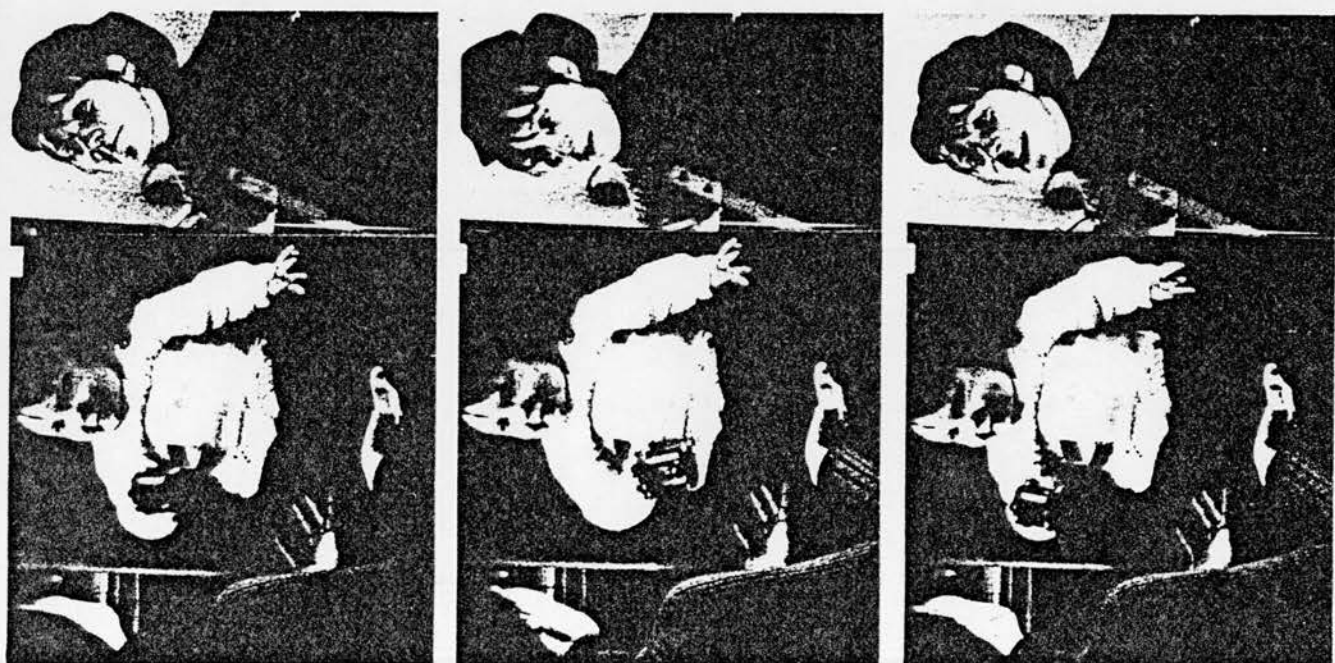


Fig. 4. (b) Tracey shakes rattle (bell in cage) and mother nods in synchrony. Tracey watches mother's face closely, and lags; 32 weeks (Fig. 1A).



stomach repeatedly (Fig. 5). In both games the object was a means for transmitting action interpersonally, but in the first Tracey, evidently cautious because of the novelty or "complexity" of the concept, saw her mother bring a game of the person to match her (Tracey's) object play. The latter was then repeated so that it became a cause or trigger for the shared excitement. In another form of this game the mother shows mock fright at Tracey's banging, which Tracey then repeats. This happens three times and Tracey laughs at her mother's mockery on each occasion.

Obviously such a game brings the mother to the same kind of function as the puppet which, at 5 months, Tracey had learned to activate "remotely" by pulling the string while she watched it (Fig. 4). The significant change is her acceptance of the mother as the puppet and her face as the centre of an effect which Tracey's movements can "cause". Up to this stage Tracey had been unwilling to focus on her mother's face while playing with objects, except in looming games where the face was the "object" Tracey was watching.

At 32 weeks Tracey showed several other signs of willingness to share the fun of her play. She smiled conspiratorially while her mother watched her move an object, and she accepted replacement of objects of play by her mother more readily than before. Her increased friendliness was shown by her delighted participation in the "zooming-object" or "swinging-ball" games animated by her mother, who in turn was very gay and demonstrative. Occasionally Tracey glanced at her mother while enjoying the effects, and this caused her mother to laugh.

Tracey's increased fluency of expression about the task she was doing was also shown in a succession of grimaces and smiles made when she had difficulty dealing with an object. Moreover, both her babbling and her visual control of hand groping after objects were more elaborate than in the previous month. The new expressive behaviours were matched by more complex programmes for praxic behaviour, so the whole of Tracey's intentional mechanism was undergoing important development. She attempted to generalize discoveries between objects, as when she shook a solid wooden block as if to rattle the bell in the cage. Failure to get the effect she expected caused her to give up this action quickly.

In spite of clear developments in control of her actions, and in consciousness of their effects and in spite of the above signals to her mother, Tracey still failed to act reciprocally in giving objects to her mother's open hand. Except for her sharing of mood or humour, she still communicated as if contained within the circle of her own experience and of effects immediately related to her acts. She showed subtle perception of her mother's communication, but this was shown mainly in indirect, or even negative ways, strongly regulated by herself. She was not truly co-operative since she failed to attend directly to the intentions of her mother.

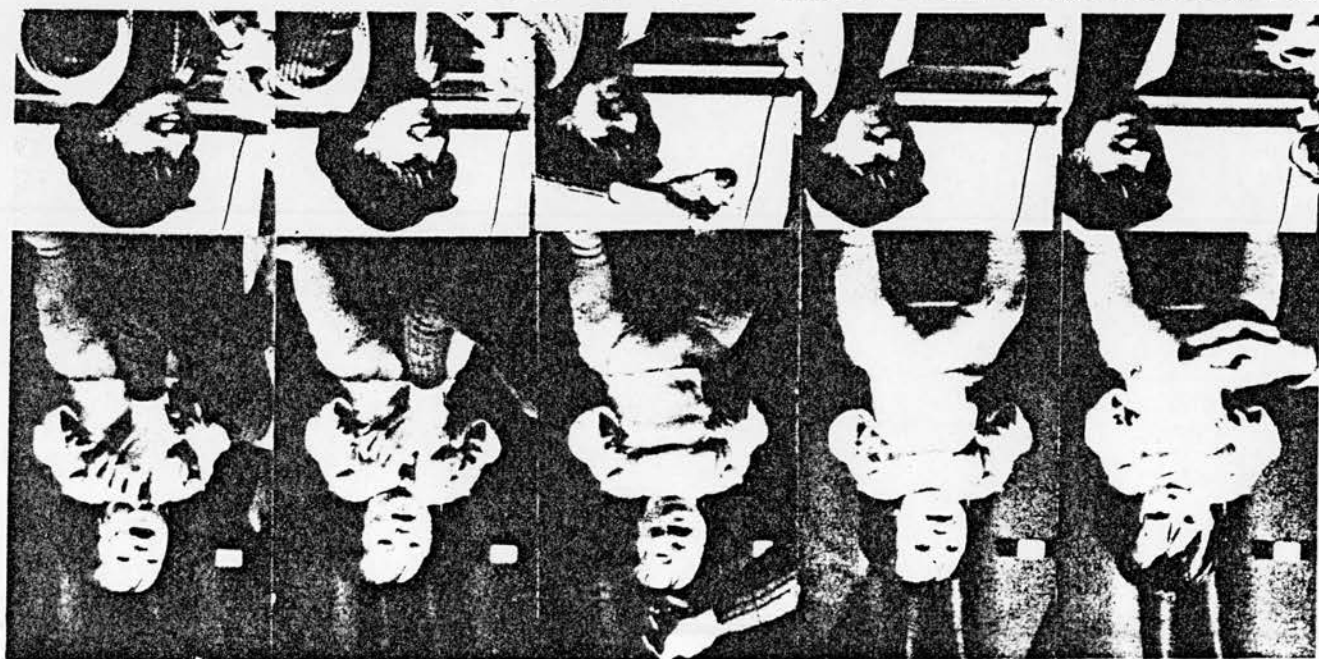


Fig. 5. Object-person game; 27 weeks. Mother carries ball high in a series of steps, then suddenly drops to touch baby on chin. Tracey watches the ball closely, then laughs twice.

The Development of Sharing of Acts with Objects

At 34 weeks Tracey played with objects at the table, banging them and groping with both hands as she shifted attention fluently between goals. Her mother took the role of observer or assistant, sitting back to pass comment, or dub in suitable voice-effects, like "Bang, bang, bang!" (Fig. 6). Occasionally she brought in a new object or changed the arrangement of things for Tracey. A small brightly painted wooden trolley with four wheels and three round men in holes was offered, and Tracey was shown how it could be pulled along by the string (Fig. 1). Tracey watched but did not imitate. While banging objects together and handling them with two hands, Tracey was beginning to look about, accept her mother's gaze and exchange smiles. This was a prelude to a new level of interpersonal exchange accompanying the handling of objects.

At 36 weeks and at 38 weeks Tracey played with the wooden men while her mother held the trolley. She banged them against the trolley while her mother made matching voice sounds. Tracey grinned then laughed without looking up and her mother laughed. Another prelude to shared action of a more complex kind was seen in an exchange of banging on the table at 38 weeks. Tracey and her mother banged hands on the table in alternation and Tracey, while looking at her mother, grinned at the effect they produced.

Now Tracey was adept at two-handed play and exchanged objects between her hands many times. She often rotated objects in her hand, tending to explore them this way, using distal (wrist and finger) movements, as well as simply transporting or banging them by proximal (arm and shoulder) movements. She also twisted her hands at the wrist in a clear gesture of impatience when frustrated, looking up and vocalizing at the same time. Later she looked up again and wrinkled her nose in "disgust" while shaking her leg in impatience. She looked about the room avoiding a small ($\frac{1}{2}$ in.) bead swinging on a thread, which was too small for her to grasp. She took objects offered by hand but held them back and dropped them, failing to return them (Fig. 7). A zooming-object game interested and amused her; then she looked away, self-possessed. She watched demonstrations of how to move the wheels of the trolley, which squeaked, and how to place the men in the holes, but did not imitate.

At 40 weeks Tracey's mother became an acknowledged participant in actions. Tracey repeatedly looked up at her mother's face when receiving an object, pausing as if to acknowledge receipt. She also looked up to her mother at breaks in her play, giving the indication of willingness to share experiences as she had never done before. Tracey pulled the cart in by the string, watching it move remote from her hand. She accepted many changes

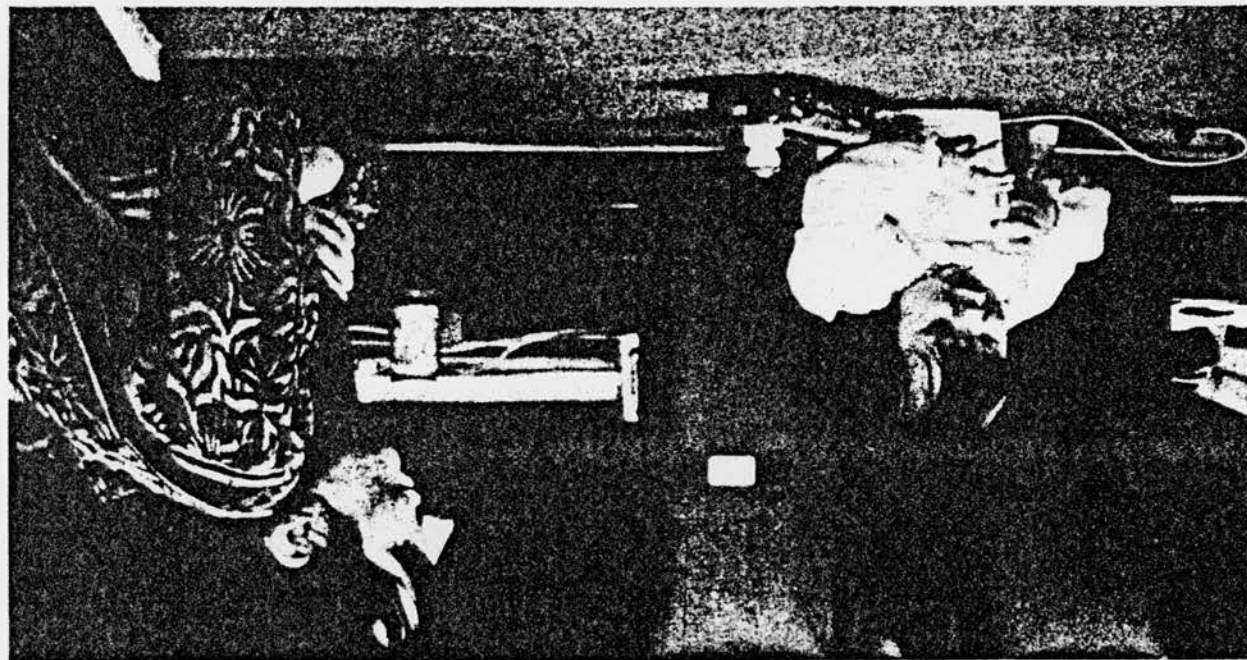


Fig. 6. Mother watches while Tracey is engrossed in play. Tracey vocalizes. She does not look at her mother. 34 weeks.

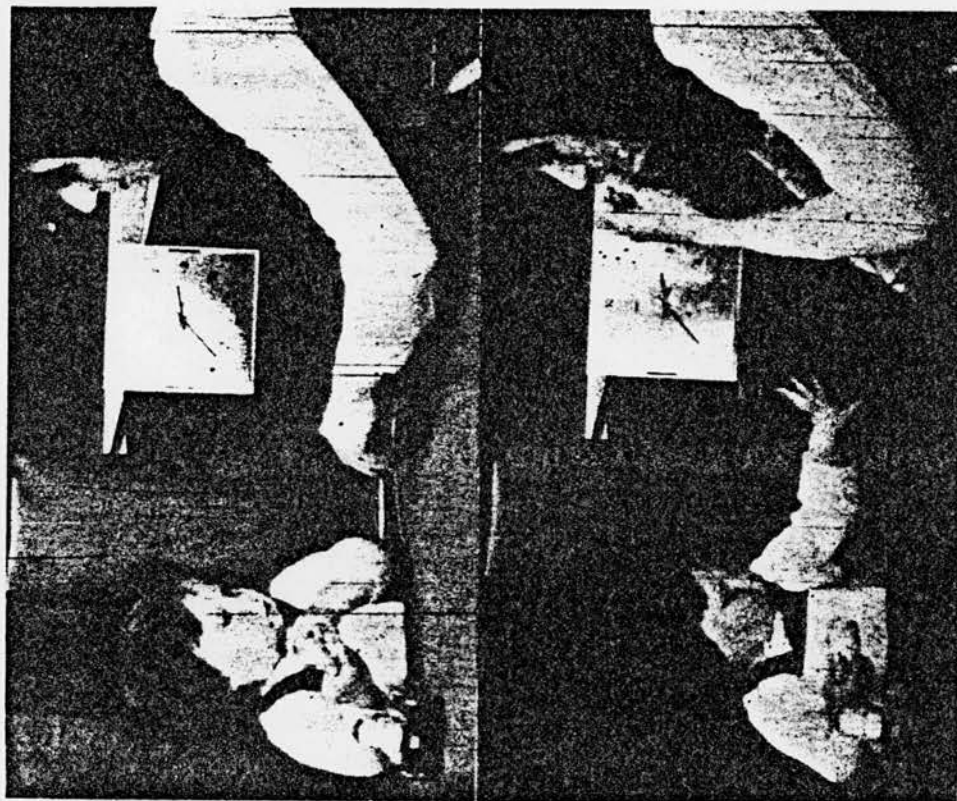
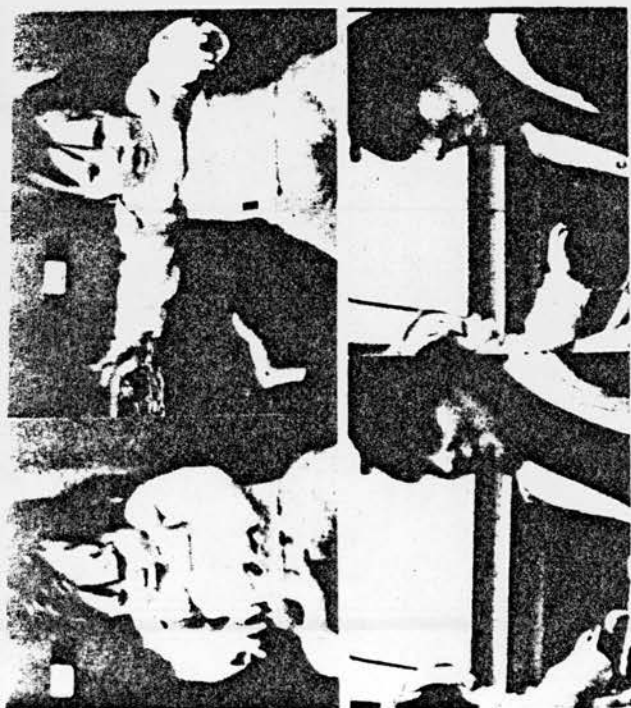


Fig. 7. Refusing and assisting.
 Opposite page, top: Tracey takes a ball then holds it back and drops it; 27 weeks.
 Opposite page, bottom: Tracey pushes mother's hand away, without a smile; 26 weeks.
 Above: Mother pushes head aside and Tracey imitates to aid with a deliberate sweeping movement; 45 weeks.

among coloured beads by her mother, pausing in her manipulation to look at what was shown to her. She followed when her mother pointed to a bead while speaking, and calmly accepted removal of an object without loss of interest in the shared play. At one point she gently moved her mother's hand aside so she could get to beads beneath it. When her mother showed her how to make the wheels of the inverted trolley turn and squeak, Tracey watched closely and touched the wheels. When her mother eagerly said "Pull it!", Tracey made a move to draw the trolley towards her, but failed because the string was not taut, at the same time, expecting success, she looked up and smiled eagerly at her mother. This was clearly a learned anticipation of the pleasure they usually shared when she did the trick of pulling in the trolley correctly. Throughout this session the mother was showing and giving things to Tracey who was more docile than ever before, and more "interested". In playing with objects they shared the effects almost equally. Tracey looking up at her mother and smiling when an entertaining effect was produced.

At the same age Tracey and her mother played a new game in which the mother was both giving and taking back. Her mother repeatedly offered an object, then quickly drew it back. She watched Tracey who looked up and laughed.

Much of the interplay between Tracey and her mother was carried by vocalization. Tracey hooted with excitement while banging, or grunted with concentration, and then, when trying careful variations in manipulation, made gentler cooing sounds and more articulated babbling. She did this co-operatively in a joint game. Her mother talked in a relaxed way and added sound effects (e.g. "What are you doing? . . . Bang, bang, bang") but she asked what Tracey wanted much less frequently than before, saying instead things like "Take this one" or "There you are" as she showed and gave.

At both 45 and 47 weeks a large transformation in the balance of Tracey's communications with her mother was completed, and the effect on her mother was very great. For the first time Tracey gave a play object happily to her mother when asked to do so (Fig. 8). They played with one of Tracey's toys, a rattle with a clear plastic globe, and a ball inside it (Figs. 1 and 9). The globe could be unscrewed from the handle to take out or put in the ball. When the ball was offered to Tracey she promptly put it in the globe, and when her mother assembled the two parts she eagerly shook it. The mother made the following commentary which lacks questions (except for one rhetorical one), and is full of instructions and declarations:

"Put it in there. Take it out. There it is. Shake, shake, shake!" (Tracey hands the globe to her mother who requests by gesture.) "Put it on there, put it on there. That's it!" (Tracey takes out the object and puts it in again.) "That's it. In again. Out. Mmm! Put it in. No? That's it. Out again. Thank you!" (as Tracey hands it over to her without being asked).

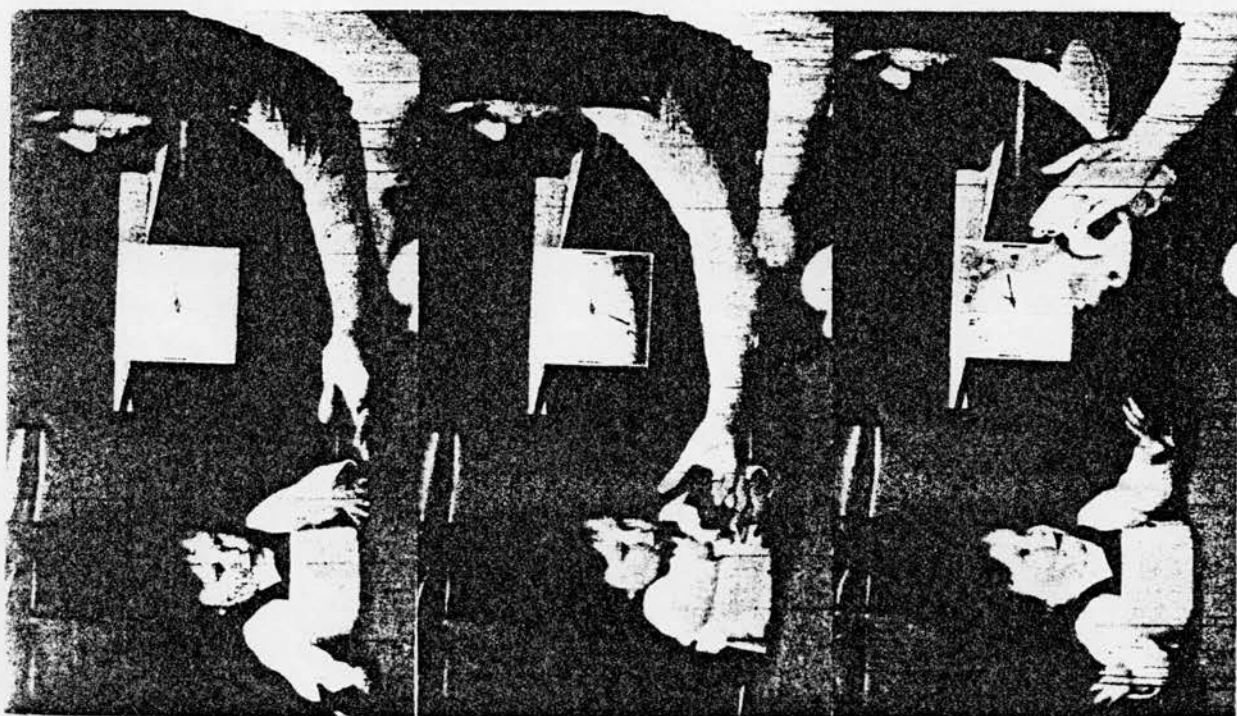
Then Tracey's mother rolled a cloth ball to her saying, "Ready, steady, go!" Tracey caught it in two hands and grinned delightedly banging the table with both hands and the ball, and looking up at her mother's face (Fig. 8). As her mother held her hand out palm up to receive the object saying, "Where's the ball?", Tracey hesitated a moment and, distracted by the sound of someone entering the room to her side away from her mother, turned to hold out the ball to the visitor. Her mother continued, "No, here; over this side." Tracey looked at her mother's hand, quickly reached to give her mother the ball, looked to her face and smiled. "Thank you!" said the mother, and Tracey gave a triumphant vocalization and hit the table (Fig. 8).

Later they played a game to demonstrate how Tracey had recently gained the trick of selecting objects named by her mother. A toy duck and fish belonging to Tracey were placed on the table. Tracey's mother said "Where is Duck-Duck?" several times. Tracey looked from object to object, "thinking" but not reaching. Her mother said "Where's Fish-Fish?", then "Where's Duck-Duck?". After behaving in a hesitant, absorbed manner for a moment, Tracey grasped the duck and handed it to her mother (Fig. 8). Tracey often made errors in this game which her mother corrected, but she clearly tried, and sometimes her choice was deliberate and correct. The significant new achievement is her grasp of the principle of the naming game. Her mother reported that in the last couple of weeks Tracey had been co-operating in a number of naming games developed out of familiar acts of giving and taking. For example, she would correctly obey the instruction "Pull the plug" after having a bath. Her mother had quickly learned to cultivate this new interest in words.

Throughout this session the giving-and-taking game was played many times, the mother uttering directions and naming the topics for exchange. They also repeated the truck game, the mother saying "Weee!" as Tracey, smiling eagerly, pulled the string to draw the truck towards her.

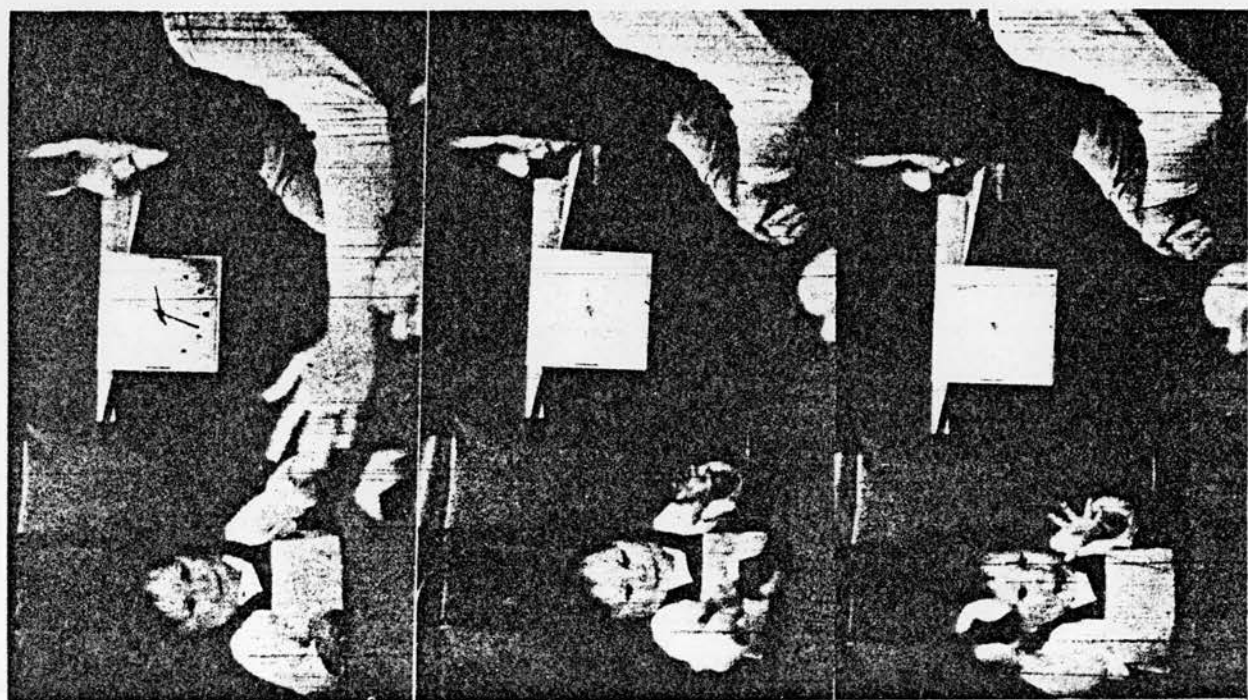
Frequently Tracey made vocal commentary in a quiet pause while her mother silently observed her. When her mother pushed the bead on the string of the truck to get it out of her way, Tracey immediately turned to imitate the act co-operatively (i.e. to aid) (Fig. 7). This is in total contrast to the same gesture used 4 months previously to push aside (to refuse) a bead offered by the mother (Fig. 7).

In contrast to her earlier *reactive* regulation of Tracey's behaviour, reflected in a questioning and coaxing manner of speaking, Tracey's mother now regulated in a *directive* manner, issuing instructions and asking rhetorical questions. Tracey, for her part, acted as if she happily accepted the leadership of her mother in a joint definition of experience. We believe the mother's behaviour to be a response to Tracey's acceptance of or seeking for directives.



(b)

Fig. 8. Accepting and giving; 45 weeks.
 (a) Tracey accepts a ball in a rolling game. Beats the table in triumph.
 (b) Tracey places ball in mother's hand when a request is made. Beats the table, smiling at mother.



(a)

With this new co-operation came new games: a most interesting example, for its cognitive implications, being the hiding and finding which arose as a variation of putting in and taking out (Fig. 9). The little wooden men were placed in a tissue box. Tracey was led to "find" them by her mother and she showed her grasp of the communication of the game by a look of surprise and vocalizing. This initiated her mother's mock surprise and high pitched "Oh!". They played a long game in which the men were repeatedly hidden, the mother overturning the box with the men inside leaving Tracey to lift it up and "discover" the men. Tracey was a willing participant. The mother vocalized "No" with a shake of her head and downward intonation, or "That's it" with rising voice. It is obvious that Tracey's co-operation and imagination of the mother's role permits her to share in a rich variety of shared climaxes in experience and many modes of action, each marked with a distinctive vocal comment from the mother.

Comparisons with Other Infants

Tracey's development between 6 and 10 months is summarized in Table I.

Closely similar findings have been obtained from biographical films made with one other female baby and two of the first author's own boys. Prior to 9 months, when manipulating objects and babbling, each of the four children was playful in games developed by a familiar partner out of what they were doing. After 9 months they rapidly developed a more observant social behaviour, adjusting their interest in objects to their partners' interests by complex acts including handing of objects to others, and pointing while vocalizing, both these acts being combined with looking at the partner's face and smiling.

The consequence of this new level of awareness of the mother appears to have been that it was the mother who learned a new set of rules.* After 9 months each baby made new steps of behaviour imitated from the mother, became obedient to directives such as pointing and verbal instructions, and learned to respond correctly to a few, often repeated, names of objects or actions. The efficiency of communication and learning was enormously increased, first, by the infant taking on an active role of giver, shouter or agent, with voluntary recognition of the mother's interest, and, secondly, by the mother adapting to this.

In the previous 6 months, complex changes took place, some of which,

*This account is based on behaviour with the *mother*, but this does not mean that other persons were not treated in similar ways. I have not studied other relationships, except for observations of my own infants with me. (C. T.)

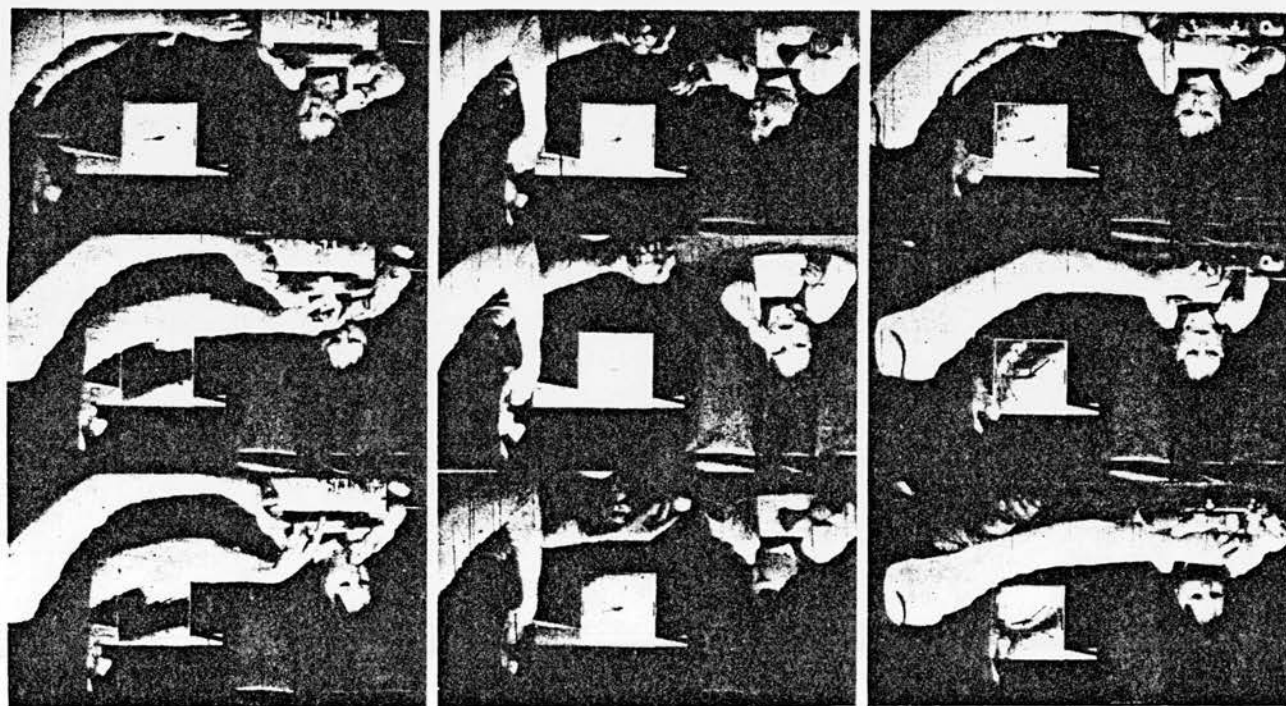


Fig. 9. Obeying indications, performing a task with help and following demonstrations: 45 weeks. Left: Mother demonstrates putting a man into the trolley. Tracey makes a gesture, tapping man on trolley (cf. Fig. 1E). Middle: Mother returns the ball to Tracey, who places it in the rattle handle then tips it out. She looks at her mother and bangs the table (cf. Fig. 1C). Right: Mother points inside a tissue box and drops two dolls into it. Tracey follows her lead eagerly, vocalizing. She quickly understands and puts all three dolls in the box without further prompting.

Table I
Tracey and mother

	25 Weeks	45 Weeks
1.	Baby only occasionally initiates face-to-face interaction. Does not interrupt own activity to do so. Smiles and looks at M during person games or games using animated objects at climaxes determined by the motion.	Baby looks and smiles at M often during joint activity with objects, greeting her readily. Will interrupt own activity with objects to do so.
2.	Baby's looking at M's face is unpredictable. It elicits an immediate response of pleasure.	Baby looks at M's face in response to an instruction and to solicit assistance. M often takes these looks of recognition for granted.
3.	Baby shows resistance to M's social attentions by turning away.	Baby does not turn away to refuse attentions from M.
4.	Baby may show extreme interest in objects to the neglect of M. Does not combine attention to objects and M.	Baby can integrate attentions to M and objects in co-operative activity.
5.	Baby's handling and explorations of an object are limited: reaching, grasping, putting to mouth, holding at side, banging and dropping. M must follow B's changing interest in effects produced. May develop games, but there are no equally balanced transactions.	Baby's handling and explorations of objects are more complex, involving sequences like pulling in the truck and then taking out the men. M can develop B's interest into elaborate joint activities where M knows the overall plan and directs B to fit in. B also anticipates the sequence and may direct parts of it.
6.	Baby watches M's activity with an object, especially if activity lies within B's "secondary circular reaction". B does not imitate.	Baby watches M's activity and will use it as a model, especially if encouraged to do so by M. Imitation by B is easily obtained.
7.	Baby takes object offered by M, almost invariably drops it. Does not give an object.	Baby takes an object offered by M, gives it to her when asked, and in a sequence of action when they come to M's turn.
8.	Baby may follow M's pointing to an object in front of B and pick up that object, though not reliably.	Baby easily follows M's pointing to an object and picks it up. B is highly responsive to directive gestures of M.
9.	Mother has to be very soliciting to engage B's interest in a social game.	Baby is far more easily socially engaged, sometimes inviting a sharing of pleasure.
10.	Baby smiles and laughs at games and "jokes", orienting laughter and smiles to M, but needing support of M's involvement in B's actions.	Baby laughs and bangs table triumphantly, in demonstration of pleasure in mastery of a joint occupation with M. B's humour is also more autonomous; smiles when carrying out an act herself.

Mother's speaking is turned into "baby-talk" games with body movements and changes of face expression.

1. Baby does not understand words. Baby shows she knows the names of some toys.

From the point of view of a fellow communicator, seem negative or rejecting. Tracey's dropping of received objects at 21 weeks and refusal to give objects until after 40 weeks was, however, not abnormal because the other infants did the same at this age. Tracey's playfulness at 6 months and later development of a rich triadic person-person-object style of play shows she was not more avoidant or withdrawn than the other infants in spite of her mother's slight depression when Tracey was 2 to 4 months of age.

The avoiding shown by all the infants at 4 months, compared to their eager acceptance of eye contact in conversation-like exchanges at 2 months, started just prior to the maturation of arm control and effective prehension of objects. In several cases, the refusal to look directly at a partner was most marked in relation to the mother. This may be partly an artifact of our method of observing in staged encounters, but it certainly is proof that the withdrawal was not due to perception of a "stranger".

By 5 months, objects and events selected by the infant for attention were taken up as mediators or token for interaction of feelings or intentions between infant and mother. For the next 4 months person games and object games excited the infants and provoked signs of pleasure. The infants also clearly enjoyed being in the presence of familiar people and in familiar surroundings, and they fretted when left alone. Being in familiar company encouraged play with voicing, mouthing and handling, all of which were presumably enriched by the development of new capacities for perception of both people and objects. But in all this time the infants often withdrew from intimate face-to-face communication, and they usually did not seek the eyes of people or smile to them while interested in objects. Except for their union in games, objects and people were focused on separately.

If personal confrontations are forced on infants at this age, they resist or withdraw. Withdrawal is not restricted to strangers. At 3 to 6 months the unfriendly behaviour may elicit comment from mothers who say, spontaneously, that they felt "hurt". We have repeatedly recorded a mother to spontaneously grasp her 4- to 5-month-old's head in an attempt to regain eye contact by forceful head turning. This manipulative tactic always failed. The mothers had to accept less direct forms of communication, and then the babies responded well.

With babies in the second and third month, most mothers we have filmed

played games that involved touching the infant's body, like pat-a-cake with the hands, bouncing the legs, shaking the cheeks, prodding the nose or stomach. Gradually, it would seem the mother herself is accepted as a game object as she mirrors the infant's acts of expression. After this the play incorporates objects that the infant has accepted as foci for interest. We found that by 6 months these games via objects, or with parts of the mother's body treated as objects, became the infants' preferred form of play. Then, at 9 or 10 months, they started the deliberately co-operative form of interest in objects which transforms play into exchange of acts of meaning.

DISCUSSION

It remains to be seen if the above apparently endogenous changes in intersubjectivity during the first year are universal in human development. Obviously some forms of cognitive development of the infant are cultivated or facilitated in our society by presenting infants with special toys, like coloured balls, rattles and soft effigies of animals or persons, and infants must be affected by the custom of leaving them on their own in playpens or cots surrounded by toys. Professor Mundy-Castle of the University of Lagos has told us that in West African cultures there is a great emphasis on social interaction with babies, who are handed round and played with verbally by everyone present. There is not much emphasis on object games. Annette Hamilton reports the same for Australian Aborigines (Hamilton, 1970). In spite of such differences in treatment of infants, we believe that certain conclusions drawn from Tracey's development must have wide implications for all humans.

We believe that Tracey's changes were emergent in her mind, and that her mother, though sophisticated by artifacts and ideas from her family, social group and culture, was unconsciously tutored and changed by the changes in Tracey. We conclude that traditional games and toys (like "Pat-a-cake", "Ride-a-cock-horse", rattles, dolls, balls) may best be understood as responses to the infant's innate human talents for play. We would describe the mother's acts we have seen as adaptations to the infant's changing play, and this in turn reflects the infant's changing understanding of her mother as a person. This is not to deny that what a mother does may be essential for the infant to expand his knowledge at an optimal rate. If she acts with spontaneity and freedom in responding, she cannot help creating a series of demonstrations fitted to the infant's cognitive and interactive schemata and stimulating to their growth. Helpful play appears to be her natural response

to the infant's communicative personality and it can take many particular forms. Indeed each mother—infant pair we have observed created together a unique repertoire of games. The habits of play evidently became the basis of a unique companionship in each pair.

A nativistic interpretation of infant development fits what has been seen with younger infants. The changes of communication throughout the first year appear to be principally due to differentiation of a highly complex, general intersubjectivity which is manifest very early in rudimentary form (TrevARTHEN, 1977c). This function identifies persons, regulates motivation and intention toward them, and simultaneously forms rudimentary acts of speech and gesture in patterned combinations and sequences. It also provides internal images of face and hand movements for the identification and imitation of the expressions of others. Acts of adults that signify interest and understanding to other adults are selectively perceived by 2-month-olds, too, and taken as analogous to their own acts of like form. When the mother expresses excitement or pleasure it stimulates a function in the infant that is capable of generating a mirror or complementary act. Proof of these propositions is to be found in the communications of *primary intersubjectivity* that develop into elaborate form in the second and third months after birth (TrevARTHEN, 1974a,b, 1977a,c).

The elementary dyadic interpersonal function is evidently changed as infants develop effective prehension and an increased facility for observing events and the useful properties of objects (TrevARTHEN, 1977b). We conceptualize this development to be by differentiation of a fundamentally coherent field of intentionality which is, however, already anatomically partitioned at birth into three modes out of which three kinds of experience and action are generated postnatally: These modes are probably three real systems of the brain that achieve functional differentiation by interaction with each other and with the environment. Forms of action and perceptual processing appropriate for (1) knowing and using objects (praxic mode), for (2) communicating with the human world (communicative mode), and for (3) acting in self-directed or thoughtful manner (reflective mode) appear as distinct rudiments in the newborn. Of these three, the communicative mode appears to undergo greatest elaboration in the first phase of infancy (second and third months). Then it becomes adjusted to developments in the other two modes, especially the praxic. In consequence infants show specific withdrawal from proffered interpersonal contact, and they relegate sharing of experience to more indirect channels. With increased interest in looking at and handling objects comes a playfulness that eventually permits the infantile intentionality to achieve a new level of integration.

Once free interaction between communicative and praxic modes of action is achieved, the infant suddenly shows behaviour that is unique to man

in its complexity, and full of potential for the development of knowledge, joint enterprise and language. When a 10-month-old offers an object to the extended palm of another, makes a vocal and gestural utterance in the form of a command or declaration, responds with precise co-operation to a request expressed by facial signs and in gesture and speech, plays a give-and-take game, or obeys learned instructions of speech or gesture to choose objects or perform specific manipulations with them, the expressive manner of what the infant does gives these acts a co-operative form seen in the behaviour of no other species. We believe the same developments will be found in all human societies, but think it likely, too, that cultural differences will take root at this stage of infancy.

Figure 10 is a diagram of the proposed transformations of the intentional mechanism that take place in the first year.

This view of the formation of what we call *secondary intersubjectivity*, linking mother, infant and object on an equal plane of importance, is not compatible either with behaviourist (Watson, 1924) or pragmatic (Mead, 1934) views of the development of human social intelligence, nor does it relate except superficially to the Piagetian theory of cognitive development in the "sensory-motor" period (Piaget, 1970). It requires an innate interpersonal or intersubjective function lacking or unstated in these. The assumption that the young infant is isolated in egocentricity is quite incompatible with our observations.

A significant growth transformation of the infant mind at about 9 months has been detected by all who have made adequate biographic observations. However, different theories lead to widely different interpretations. Excluding extreme learning theories which offer no explanation for such a change, the two principle structuralist (or constructivist) theories for mental development both acknowledge the complexity of the infant's cerebral endowment in principle, but they attribute change in behaviour to progressive attainment of skill; that is, to the integration of practical experiences into representations and concepts. The first theory, that of Piaget, concentrates on cognitive growth—growth of knowledge in the private mind of an actor-perceiver. The other, identified with Mead, emphasizes social and communicative interactions between the infant and the mother of other persons. Society is taken by Mead to be the principal source of rules for knowing people and communicating with them.

A third theory, that of the psychoanalysts, was at the start more concerned with the pathology of adult personality structure. Freud, of course, presented a developmental theory of instinctive motivation, based on his case materials. Psychoanalytic theory is so different from the other approaches to infancy that it must be considered separately.

Piaget (1952, 1962) has captured, with wonderful precision, almost all of

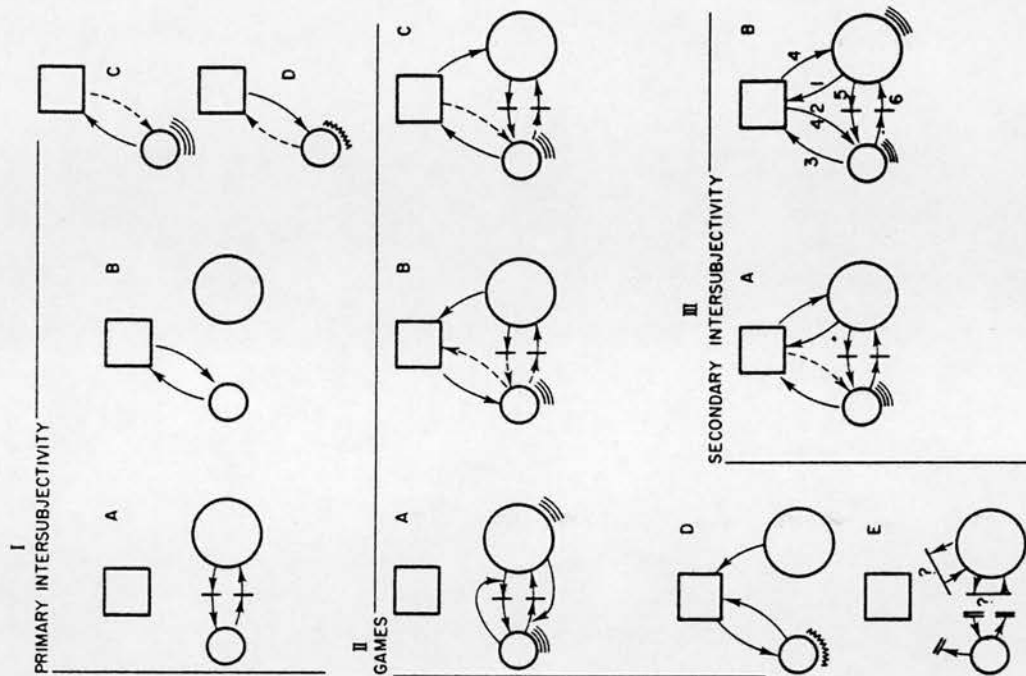


Fig. 10. Functions in the development of secondary intersubjectivity. (IA) Communicating: baby and mother interact face-to-face; no interest in object. (IB) Acting on an object: baby acts; mother watches. (IC) Piagetian Assimilation: play with "pleasure in mastery". (ID) Piagetian Accommodation: imitation, tracking with "serious intent". (IIA) Person-Object Game: baby acts on mother's acts to baby. (IIB) Object-Object Game I: mother moves object to amuse baby and watches the baby's face. (IIC) Object-Object Game II: baby moves object and mother tracks it; baby watches mother and is amused. (IID) Baby takes offered object without acknowledgement of mother's intention to give. (IIE) Baby is asked by mother to give and refuses, avoiding mother. (IIIA) Baby gives object and shows pleasure when it is accepted. (IIIB) Full person-person-object fluency, e.g. mother shows baby how to do a task (1 + 2), baby accepts (3 + 4), then looks at mother and both are pleased (5 + 6).

the events we observe in Tracey's behaviour, except those concerning adjustment of her attentions to her mother. Indeed, Piaget presents himself as a responsive but invisible examiner of the developing imagination and reason of the child. Even when studying imitation and play, he makes his analysis in terms of a "thinking" that allows the infant no special awareness of humans as persons having a unique potentiality for shared awareness and shared intention (Piaget, 1962). The essential process in early infancy is development of imagery for perception of objects. This is built up by amalgamation of cerebral reflexes that guide movements of the eyes, hands and mouth through the senses of sight, hearing, touch and taste. Objects are perceived through effects they produce in sensory-motor reflexes when the infant orients to or manipulates them.

Piaget describes a major transformation in the child's mind at about 9 months. This brings into being "the concept of the object". Before this (Stage III) the infant practices "secondary circular reactions", repeatedly transporting objects held in the hand to cause interesting perceptions of graded novelty. Objects are not yet conceived by the infant as substantive with intrinsic capacity for displacement or persistence in time and have no fixed shape or size. Interest in them ceases when they are covered, and they are not expected to have a given form from one appearance to the next. After about 6 months, the inertial, sound-making, appearance-changing properties of objects transported by the infant cause mental images that are retained to represent objects with constant intrinsic properties. At 9 months (Stage IV) the infant begins to observe the effects of exercising skills of visual exploration (grasping, holding, dropping, hitting, etc.) in sequential combinations. This results in the definition of certain "instruments" that add meaning, for an observer, to the infant's acts (Piaget, 1952, 1970).

The infant, Piaget says, *enjoys* the power of exercising control over the perceptions of objects, so must have a means of evaluating control. By this evaluation, Piaget explains the differences between the "serious intent" (intentional accommodation), by which an infant will explore the experience of an unfamiliar object, and the laughter or smiles that accompany play with a familiar object. The properties of something familiar, being correctly predicted by the infant, offer no further scope for serious investigation (Piaget, 1962).

Piaget, failing to recognize that humans are essentially different from other objects in the infant's world, does not register the fact that infants aim their emotional expressions (of "joy", "serious intent" or "surprise") to persons. Moreover, for him imitation begins very simply as the accommodation of orienting to the displacement of an object, or the mindless re-creation of the sound of a model that itself matches one of the infant's own sounds (e.g. contagious crying). More complex imitations are achieved by associative

learning and reinforcement from adults who selectively reward acts of the infant that, by chance, reflect their models. Likewise, the ability of a 10-month-old to give an object on being asked, which Piaget reports, is no different, he believes, from the ability achieved at the same time of placing a ball in a container. Laughter in a game with the mother's face or with an object animated by the mother, is simply due to the infant having a power to predict what will stimulate him after he does something—once again, a private experience of the power of mastery causes joy.

At Stage IV the infant will snatch a cover off a hidden object, and enjoy this instrumental act for its sake. This leads to experimentation with means (intermediate steps) for doing things. This is, Piaget concludes, the first time that the infant can imitate an act seen by movement of a part of his body he cannot see. The achievement is simply due to learning of the mental link between each such act and some other movement which causes a stimulus like the model. Thus, poking out the tongue to imitate is said to involve prior observation of the combination of tongue protrusion with making of certain voice sounds. We now know, however, that silent tongue protrusion (and other "self-invisible" expressions) may be imitated by 1-month-olds (e.g. Maratos, 1973).

Piaget (1932) defines morality as "the logic of action". He suggests that "we can find, no doubt, even before language, all the elements of rationality and morality" but "it is persons external to him who channelize the child's elementary feelings; those feelings do not tend to regulate themselves from within". Moral reciprocity, according to Piaget, is a rational achievement of the child several years of age, when he moves from an egocentric to a socio-centric condition. Kohlberg (1969) likewise considers the infant to be wholly egocentric and lacking in moral sense.

Close followers of Piaget's theory of cognitive development may note significant changes in the mental functions of infants in the last trimester of the first year, but add nothing of significance to his theory of infancy, even when they apply it to development of knowledge of persons or "the self" or to the development of protolinguistic functions (Kagan, 1971; Hunt and Kirk, 1971; Flavell, 1974; Kohlberg, 1969; Bates *et al.*, 1975; Schaffer, 1971; Lewis and Brooks, 1975). As an example of how the cognitive theory is applied, experiments on the attending of infants to events undergoing mechanical or electronic change indicated that babies become more observant and more expressive about what they perceive towards the end of the first year (Zalazzo, 1977). This is considered to be due to development of "thinking". Bates *et al.* (1975) similarly consider that the ability of a 10-month-old to perform illocutionary acts of communication, intended to make others act as instruments or recipients of information, follows from development of the Stage IV or Stage V object concept.

Bower's studies of cognition in infancy (Bower, 1974) lead him to propose a revision of Piaget's concept of development (Bower, 1977; Bower and Wishart, 1977). Experiments with visual tracking, prediction and reaching of infants less than 6 months old show that some concept of an object, located outside the body, capable of displacement over time and with its own size and form, is present in what Bower calls "abstract" formulation for the whole infant from the start. It is, therefore, not constructed by assembly of sensory-motor reflexes, even though the object perceived does gain in specificity with experience of instances and contexts. This does not seem to totally contradict Piaget's views and it resembles Werner and Kaplan's idea of differentiation (Werner and Kaplan, 1963).

Bower (1977) in reviewing the evidence for an alternative general theory of psychological growth, has suggested how it may explain infants' interest in persons and the development of individual attachments or relationships. He uses evidence from the powers of young infants for imitation and their varied expressions of pleasure with human, non-human, reactive and unreactive stimuli. Nevertheless, Bower's analysis remains rational and impersonal. His infant is developing propositions. When explaining what he means by a more abstract representation, Bower refers to Russell and Whitehead's logical theory of Types and its use by Gregory Bateson (1973) in psychology. He does not distinguish intersubjective functions as requiring a distinct mechanism, except to say that humans are probably born with a need for human company. He observes that "set patterns of interchange" with people are acquired, but generalized detectors for human speech are present from birth. Taking the experimental findings of Lewis and Brooks (1975) on reactions of infants to photographs of people, he concludes that gender identity is acquired by specification within a general recognition of humans that is all that is expressed in early months. Overspecification of the identity of the mother and of the relationship to her is responsible for fear of strangers and separation anxiety.

The formulation of this theory is itself too abstract to help us explain the emergence of secondary intersubjectivity. However, in developing his thesis Bower makes an important point with respect to apparent losses or repetitions of conceptual skill in infancy and childhood. For example, infants change in their ability to predict relations between an object's perceived form and size, and its mass. When reaching and grasping at 18 months, an infant knows an object's mass from its appearance (Mounoud and Bower, 1974). Speaking at 4 years, the same child doesn't know. Such fluctuations in ability mean that incomplete study of a given development, missing early manifestations of a function, may give a false indication that the function in question is built up by the child learning how to combine elements. Repetition of any one ability considered separate from the whole pattern of

psychological development is analogous to a cycle of differentiation and reintegration in morphogenesis of one organ in the whole body of an embryo (Weiss, 1939).

A comparable analysis may be applied to epigenesis of the precursors of communication. Halliday (1975) describes "previews" at about 5 months in the attainment of early protolinguistic abilities. We have observed decline in eye contact, smiling, prespeech and gestures, between 3 months (primary intersubjectivity) and 6 months, and then increase of these behaviours at 9 months (secondary intersubjectivity) (TrevARTHEN, 1977b). At the same time that primary intersubjectivity is declining, the infant loses an inclination to imitate mouth movements and voice sounds (Maratos, 1977). The second form of intersubjectivity is not acquired by assembling reflex reactions to persons and objects. It requires formation of new kinds of function combining preformed intentions to objects and preformed intentions to persons.

In contrast to the Piagetians, those who concentrate on the contribution of the social environment of the infant to development include pediatricians with concern for assessment of the adaptation of infants to their caretakers and the prospects of artificial management of infants in hospitals. Developmental psychologists now seek specifically social explanations for the development of language, and confront such socio-political questions as the genesis of race and social class differences in school performance, or the causes of differences between intellectual developments in different cultures. Infants are increasingly seen to be highly responsive to human contact from birth and their development is now known to be profoundly affected by isolation from the mother or failure to form an emotional attachment to her. A baby is thought to enter quickly into a web or network of social interaction with his or her immediate caretakers, then within the first few years this extends to include their peers and other family members.

All kinds of psychological functions are now seen to develop in dependence on this social context (e.g. Lewis and Freedle, 1973; Schaffer, 1977). It is generally believed that interaction with people permits a baby to learn rules for sharing, teaches them how to use objects and eventually transmits a language code to them. The infant's development is supposed to depend on the mother teaching reciprocity in dialogue, how objects may be used, what effects they may create and how to speak about them. Knowledge of the infant about people as well as about objects is said to be developed by socialization which depends increasingly on transmission of the acquired knowledge, techniques and social conventions of persons close to the infant. The process of acculturation is continued in childhood by formal schooling.

In recent accounts of communication in the first year a special innate ability to sense persons and to communicate is granted to infants (Bell, 1968;

Newson and Newson, 1975). Nevertheless, the acquisition of rules of exchange, in the sense of symbols with shared social significance, is still thought to be due to training or continuous progressive adaptation (Bruner, 1975; Newson and Newson, 1975). The endogenous base for this acquisition is still unknown. Some consider the original response to persons to depend on a refined but automatic sensitivity of the infant to the cadence and contingent responsiveness of stimuli emitted by attentive persons (Condon and Sander, 1974; Watson, 1966, 1977). When confronted with the patterns of actual communication this explanation is seen to be insufficient. The infant has elaborate regulatory power and a capacity to adjust to or imitate the form of communicative expressions of adults (TrevARTHEN, 1977c).

Ideas about language acquisition were changed by Chomsky's arguments for an innate language acquisition mechanism that could be held responsible for the grammatical form of human language intentions (Chomsky, 1965). Lenneberg's (1967) biological observations on language development were also influential. Subsequent studies of early language (Bloom, 1970; Brown, 1973) and of mothers' speech to infants (Snow, 1972) suggest that the psychological rules of communication necessary for the start of speaking are more concerned with establishing semantics in patterns of joint interest in surroundings. Claims for an innate syntactic function have weakened. The mother, in constant attention to the infant over 1½ years before the baby speaks, has been found to be extremely perceptive of opportunities to give meaning or impute intention to what the infant does in relation to her or the environment. She is thought to codify the infant's adventitious and imitative acts in words and to guide the formation of syntactic structures (Ryan, 1974; Snow, 1976; Newson, 1974; Newson and Newson, 1975; Holzman, 1972; Bruner, 1975; Ninio and Bruner, 1977; Lieven and McShane, 1977). The mother also begins the process of transmitting rules of culture to the infant (Shotter, 1974; Newson and Newson, 1975).

Such an explanation of the development of communication as an acquired social skill linked to experience requires careful assessment in the light of what has been found by accurate descriptions of what infants do. There are extraordinary regularities in development. Changes are initiated, not by the adult rule bearers, but by the infant and child. The changes reported here in the infant's intentions at about 9 or 10 months transform the opportunities for communication and cause the infant to perform deliberate, self-conscious and reciprocal sharing of a focus or topic with another. Apparently the infant offers to others the general structure of language behaviour, and then regulates a developmental timetable for acquisition of its differentiated subverbal rules. Nevertheless, most psychologists prefer to explain the changes as originating from the social environment.

By 2 months the infant takes turns in expression and vocalization,

generating rudimentary utterances in a dialogue-like exchange (Stern, 1974; Snow, 1976; Bullowa, 1977). This is regarded by Schaffer (1977) to be a learned ability, but there is only circumstantial and highly selective evidence for this interpretation which begins with a denial of an innate intersubjectivity. By 9 months the infant is co-operative in distributing attention to objects even following another's gaze or pointing (Scaife and Bruner, 1974; Murphy and Messer, 1977). Although infants make the movement of pointing from 6 weeks (TrevARTHEN, 1977a,c), deliberate employment of this kind of act in an exchange with the mother does not occur until 9 months. In the intervening period, play involving imitation is thought to be essential to "elaboration of a rule structure in communication" and "development of signalling and sequencing rules" (Bruner, 1975), or kinds of "standard action formats" (Ninio and Bruner, 1977). Early forms of "ostension" (e.g. pointing) in this period are used by the mother in "helping the child to master the concept of a label" (Ninio and Bruner, 1977). But no theory of rule learning can explain how the process begins or why it has a regulated rate of growth. Harré, the author of the "ethogenic" concept of the creation of rules in society, admits that after one has accepted that rules govern human social behaviour "there would still remain the question of the explanation of the universality of certain social types and presentation styles" (Harré, 1974a, p. 182).

At 9 months the child within the already practiced turn-taking format of communication, reciprocates efforts to give communication, e.g. by handing over an object. The child "learns to deal with deixis in an action situation; shifting from the role of recipient to being agent, with the previous agent as recipient" (Bruner, 1975, p. 15). This is an accurate description of the behaviour, but the word "learns" is gratuitous unless the emphasis is carefully maintained, not on the origin of deixis, but on how to "deal with" or control it.

There is, indeed, a seemingly endless list of new achievements at about 9 months, all of which require the baby to identify with and reciprocate attentions of others, or to treat his or her own intentions as objects of interest (symbols?) in a field of communication. How could the following be mastered for the first time at about 9 or 10 months by infants in different societies and different decades unless the common "rule of sharing" were innate and regulated by growth to be active at this age?

Invokes adult help in performing a task with an object (Piaget, 1952; Bates *et al.*, 1975);

lies down on a pillow pretending (for other's benefit?) to go to sleep (Piaget, 1962);

performs "functional" play with toys (e.g. a telephone), using them in "adult determined purposes" (Zalazzo, 1977);

returns affection in the learned form of an embrace or kiss;

waves "bye bye";

plays appropriately with cup, spoon and saucer showing awareness of the function;

obeys simple requests, e.g. "Give me cup";

removes inappropriate clothes, e.g. a bonnet put on indoors;

imitates demonstrated actions on objects including pointing to an object with exclamatory vocalization;

marks paper with a pencil in imitation, paying close attention to marks made (Griffiths, 1954);

plays peek-a-boo, hiding own face for another to watch;

opens and closes a book, looking at mother after each move;

holds a cup to the mother's or doll's mouth;

shows toes when these are named by the mother (Bruner, 1975);

points to indicate objects that are beyond reach or in a picture form and unmanipulable (Bates *et al.*, 1975; Ninio and Bruner, 1977).

Everything in these acts is specified to a referent person or is in a recognized system of meaning.

The development, at the same time as these shared acts, of the ability to understand words and then to name is evidently dependent on the achievement of communicative "reciprocation" about topics. Ninio and Bruner's (1977) study of talk with a picture book is an excellent demonstration of how the infant's knowledge of entities and the development of distinctions between and within them may be facilitated in a game of saying names while intentionally exchanging interest about shared foci.

Nine months is the time of appearance of Halliday's "protolanguage" in which his son, lacking words, could yet vocalize a number of distinct functions in joint action (instrumental "I want"; regulatory "Do as I say"; interactional "Me and you"; personal "Here I come"). All of these depend on interaction of communicative intent to define "acts of meaning", a more general achievement than the understanding and sharing of names for recognized entities (Halliday, 1975). Dore (1975) has also emphasized that well before they speak children can vocalize acts of speaking and quickly adapt prosodic inflections of subtle meaning.

In a detailed study of the development of acts of communication in three female infants in Rome, Bates *et al.* (1975) find evidence that attainment of the ability to perform "illocutionary" acts, acts that have a consciously intended aim to command assistance of another, or to transmit a declaration of experience or intent to another, depends upon attainment of Piaget's Stage V at about 10 months. There seems to be some confusion of chronology, but understanding how to use adults as tools (means controlled with respect to a specified end) is stated to depend on mastery of the object schema,

achievement of intentionality and ritualization of acts of orienting or prehension so they become "more appropriate for communicating desire to an adult". Halliday describes the same kinds of behavioural change, without reference to Piaget, as steps in emergence of a language function. In one study "proto-cognition" is primary, the other says "protolanguage" is fundamental.

There is undoubtedly considerable agreement about what infants do in communication during the first year, now that the behaviour is being studied with sufficient attention to its subtle patterns. But none of the published accounts satisfactorily explain the consistent changes.

Given what 2-month-olds can do in mutual awareness with their mothers, it seems simplest to conclude that at 9 months there is attainment of functional control, of intrinsic origin, for the use of innate and practiced communicative abilities so they can be related to physical objects that have been brought inside the field of shared experience and shared knowledge. All of the above examples fit the hypothesis of Fig. 9 that development of the infant mind brings together newly elaborated intentions to things and the giving of messages to people. We see no evidence that this achievement is the result of practice of specific rituals (rules of conduct) learned with a consistent companion. We think the acquisition of specific practices gives necessary definition to a process which is caused by change in the structures of intelligence at a deeper level; one which is basically the same for all infants. If there is insufficient opportunity for the infant to communicate, the developing function might well be weakened or even permanently disfigured. This does not mean it is not inherent and self-regulating in growth.

Further evidence concerning the growth of a fundamental mechanism of infant personality and person-perception by infants comes from observations of the few psychoanalysts who have actually studied infants, principally those of the British Object Relations School. Although analysts tend not to study the world-perceiving cognitive systems of infants adequately, they do sensitively observe personal co-operation or resistance of the infant with the mother. Since Freud made his revolutionary inferences about infant sexuality, psychoanalysis has projected findings from dissection of adult psychodynamics and from observation of regressive changes into preverbal states of the self. Direct observation of infants did not come until after a set of developmental notions had been obtained in this downward or backward way. Melanie Klein was the first to postulate infantile neuroses (Segal, 1967). She observed that after 9 months the baby was capable of remorse for causing pain to a loved one ("depressive position"). This requires that the infant develop a concept of relationship between a distinct self and another (object relation). Interestingly, this is the age at which an infant first shows self-consciousness in a mirror (Amsterdam, 1972).

It is even more recent that a few psychoanalysts, experienced with psychoses of childhood, have explored developments in normal infancy to test basic assumptions of personality development. Spitz (1965) was a pioneer, but he does not have a detailed account of the changes we are concerned with. He attributes the attainment of autonomy (the ability to say "No") to a stage toward the middle of the second year. He underestimates the personal consciousness of the infant and overestimates, as Bowlby (1969) too, has done, the specific instinctual bond to the mother as a caretaker who imitates what the infant does. His classical study of smiling (Spitz and Wolff, 1946) is surpassed by that of Peter Wolff (1963) which brings the true interpersonal communication, through vision, to the fore.

Margaret Mahler (1963) found the mother and infant to form a symbiotic community that achieves a climax of intensity between 6 and 8 months. The mother, fused to the infant's mental organization until "separation-individuation" of the infant's ego, is considered the catalyst of this process in which the infant develops a distinction between his own body, its sensations and functions, and the mother. This is close to the orthodox Freudian position. Mahler attributes changes in the emotional dependence of the child on the mother, and panic when she is felt lost, to the process of separation driven by both sensory-perceptive and motor changes. Locomotion at 9 months, for example, may pull the child too far out of a "security base" and cause panic in the child.

Winnicott (1965), who took a balanced view of all psychological functions in infant personal relations, insists on the need to treat the mother and infant as a unit, with the infant and child moving from absolute dependence through relative dependence to independence, the mother changing in parallel. He claims that if the maternal care is "adequate in important respects", "all stages of emotional growth can be roughly dated". From the "holding phase" of the neonate, in which the mother is in a state of "primary maternal preoccupation", the infant attains a "unit status" as a person "living with" the mother; that is, from being merged with the mother to being relatively separate from her. In the condition of relative dependence the infant can be aware of details of maternal care and relate them to personal impulses. This would appear to acknowledge a rudimentary intersubjectivity. The mother adapts by regulating a "steady presentation of the world to the infant" (as in the games we observed with Tracey). The first sign that the infant knows about dependence is, Winnicott believed, in manifestations of anxiety when the mother is away "beyond the time-span of (the infant's) capacity to believe in her survival". When the infant is 6 months to 2 years old the need for a healthy mother is "fierce and terrible". This is the period of special attachment to the mother or principle companion, when deprivation effects are severe (Spitz, 1965; Bowlby, 1969;

Rutter, 1972). The effect of the new mental mechanisms of the ego "is that the infant can allow for events that are outside his or her control. . . . Then speech becomes understood." In an intermediate stage of healthy development, a most important experience in relation to a potentially satisfying object is refusal of it. Then, as the object changes from being subjectively to objectively perceived, two new things appear, "the individual's use . . . of communication, and the individual's non-communicating self". These would match the communicative mode on the one hand and the praxic and reflective modes on the other.

Winnicott's account of normal development records a change in communication between the infant and mother from "active non-communication" regarding topics of interest during transition (4 to 6 months), to acceptance of reciprocal communication when the infant's separation as an independent experimenter and actor has reached an initial stage of completeness. Apparently this stage is arrived at, at least in our film situation where there can be unhurried enjoyment of each other and toys by mother and infant, when the infant is about 9 months of age. It is, according to Winnicott, a maturational change of the infant, dependent on the quality of the facilitating environment provided by the mother and other family members.

Fairbairn (1949) considered the ego to be governed in its functions not by impulses of pleasure but by relationships to "objects". That is, the fundamental property of the ego is to govern relations (between persons) and there is no need to postulate a separate unorganized "id" as a generator of primitive impulses. Thus Fairbairn arrives at a theory of innate predisposition to relate interpersonally and to social circumstances. Social life for him depended on the mechanisms of relating. Feelings of pleasure-seeking or aggression represent failures of the "object relation", not sources of personal energy. This comes close to Macmurray's theory of the innate "field of the personal" (Macmurray, 1961) and leads on to a view of the infant as inherently sensitive to the opportunities which personal relations offer.

The importance of the analytical perspective for our present purpose is that it emphasizes that the infant's ability to master objects in acts of developing intentionality must be closely tied to growth of independence from interpersonal symbiosis with the mother. Interpersonal communication must develop in some conflict with the emergence of separate, individual acts of conscious intent by the infant for himself. Co-operative use of experience, essential to language, involves joint control of these two modes of action.

CONCLUSION

The behaviour of infants in relation to others shows that they possess a rudimentary but complex understanding of persons, and that they are adapted to co-operate in joint intentions. Out of this person-relating ability, a baby develops a will to share the foci of interest in situations and to define objects of use within acts of meaning.

In the development of fundamental human skills, a regulated pattern of change is clear in the first year of life. A large step towards confidence in "self" and confiding in others is expressed at about 9 months. It is significant that the word *confidence* means both skill in making acts as an independent self, and a sense of being in a trusting relationship to another self.

Developments of personality and of communication in infancy cannot be explained by attending only to the cognitive achievements of the infant as an isolated perceiver and intender. They are probably not dependent on explorations with objects and acquisition of schemata for constant properties of objects.

The discoveries outlined in this paper illuminate a philosophic mystery that often has been made unapproachable by one-sidedness of interest in socially transmitted experience and a catalogue of learned social skills.

As Hamlyn (1974) and Habermas (1970, 1972) have argued, human understanding of people, linguistic or otherwise, requires an ability to stand in relation to a person as a person, and to act with intersubjectivity when relating to rhythms and patterns of experience. Habermas' "dialogue constituent universals" or Vygotsky's "intermental" processes (Vygotsky, 1962), are to be seen as outcomes of infantile knowledge of persons and of how to act with confidence in relation to them. The intrinsic pattern of infant initiatives and responses is as much a creator of the mother's play, baby talk or instruction as any pattern of intention, inherent or acquired, in the mother.

The vocabulary of language, games, toys and all other cultural artifacts enrich the possibilities of life of an infant because they meet the infant's habits of intersubjectivity. Changes at certain ages, such as the change at 9 months, cause the rules of interaction to change. People in the social world react by becoming affectionate, co-operative, interested and talkative, adapting to the forms of social action that seem most natural to an infant at each age.

APPENDIX

Details of Tracey's Development in her First 6 Months

In weeks 3 and 4 Tracey was alert for brief periods in a vertical chair and she oriented to and tracked a coloured 3 in. ball suspended 8-12 in. from her face. Co-ordinated *prereaching* movements which she aimed to this object have been analysed in detail to reveal a regular, periodic temporal programming and precise sequencing of movement in limb segments (Trevvarthen and Hubley, in preparation).

At 4 weeks a quiet interchange lasting 1½ minutes was filmed while Tracey was lying supine in her mother's lap. She looked up at her mother who, leaning over, watched Tracey's face closely and spoke quietly to her. Tracey fixed her gaze on her mother's face and every few seconds made small gestures with arm and hand with gradually increasing regularity and strength, and smiles and mouth movements of *prespeech*. These communicative acts were waited for and responded to appreciatively by her mother, whose periodic phrases of speaking certainly stimulated Tracey in return. This reciprocal exchange has the typical affectionate intimacy of *primary intersubjectivity* (Trevvarthen, 1977a). The "personalization" of Tracey by her mother is shown by the following transcript of her speech:

Pushing are you? Feet cold are they? Hey? Oooh! (softly) Is that better! Oooh! Is that better? Oh yes, indeed yes! Oooh! Hum? Come on! Poor feet! Oooh! Hum, hum? Why did it have to happen? (said when Tracey looks fretful) Are you not sitting up right?

In the next few months Tracey showed normal development of interest in objects and communication with persons. However, though she smiled and made gestures and *prespeech* to her mother and to other persons who spoke gently to her, she was more inclined to look at people in an absorbed, unsmiling way than some babies we have seen at this age and often she withdrew her gaze. This correlates with anxiety and distress of her mother who, at this time stated that she was neither happy nor fully confident of her ability to care for Tracey. At the end of the third month Tracey's mother was worried that she was not feeding Tracey sufficiently, and she woke at night hearing Tracey had died. In spite of these signs of strain in adapting to her baby, Tracey's mother provided affectionate care and support.

At 10 weeks our film shows Tracey looking down with an eager playful but unsmiling face avoiding her mother's gaze most of the time they were filmed together. Tracey's mother twice tried to attract Tracey's attention by touching her on the nose, and once Tracey abruptly pulled away. She

grasped her mother's extended finger and held it while looking down with a slight smile.

At 16 and 17 weeks Tracey was again preoccupied and wary with people in the lab, though smiling. She looked intently at her mother's mouth and at the mouth of a friendly female partner who spoke gently to her. Tracey's mother held up her watch on her wrist and moved it about for Tracey to "track". This captured Tracey's intense interest but she soon looked away, then made a characteristic friendly glance to her mother's eyes with raising of the eyebrows and a slight smile before looking away again. Once she grinned at her mother with a "resistant" teasing expression then looked down to avoid her mother's gaze. She was strongly attracted to nearly suspended objects making jerky attempts to reach, and aiming her mouth. She oriented her hands visually and made grabs, once successfully hooking her partly opened hand round a hanging ball to pull it to her mouth.

Tracey was probably not greatly distressed or disturbed in development by her mother's mild anxiety, but all who watched her closely felt she may have been affected. We believe she was less fluent in primary intersubjective behaviour at 2 months than she might have been. At 3 months when other infants have shown avoidance of eye-to-eye contact (Sylvester-Bradley and Trevarthen, 1977) Tracey's mother was most anxious. We do not know what was the relationship between the two effects, but it is possible that the mother's confidence, already shaky, fell significantly when Tracey became more self-absorbed, or interested in use of her own body, and looked at her mother less. Tracey's visual attending to objects in the third month and early reaching at 4 months were vigorously healthy.

At 21 weeks, after a vacation of 4 weeks over Christmas and New Year, Tracey joined in a social game in which her mother held her hands up high, moving them about and wagging her fingers while Tracey tracked closely looking from hand to hand, moving her own hands and laughing. The mother accompanied her hand movements with clicking of her tongue and a hissing sound "Pss, psss, pssss!" In this game her mother gained communication by adapting to Tracey's visual interest in objects and to her readiness for tracking them with strong head and eye movements, and was also exciting a preference Tracey had shown in watching hands, both her own and other persons. Tracey's behaviour was eager and excitedly happy.

Next Tracey's mother held up for her a puppet motivated by a dangling string with a bead at the end. At home Tracey had quickly learned to grasp and pull the string to make the arms and legs flap up and down. With help from her mother Tracey made the puppet move, watching it intently with open mouth and smile. Now Tracey's extension of the arm to reach was well controlled and she groped accurately adjusting her hands precisely to approach and withdrawal of the suspended ball.

She also picked up an object from her mother's extended palm but plainly refused to return it to the hand when requested to do so. Instead, she held it back to the side to drop it on the floor. This taking and dropping was repeated several times. Most of the time Tracey's attention was firmly on the objects presented, but once she looked at her mother's face and grinned at her instead of returning the object as requested, then absent-mindedly dropped it into the well-positioned waiting hand while looking away to the background. The act of returning the object was not deliberate. Immediately Tracey postured with extended arms and a pursed lip, teasing expression as if aware of resisting her mother's will at the same time as she acquiesced in a grudging apparently uncontrolled way, to the request to give the object. While taking offered objects, she only glanced occasionally at her mother's face and failed to place the object back in the open hand. On several occasions, after dropping the toy, she looked up an grinned to her mother who laughed as soon as Tracey's gaze met her own. There can be no doubt that Tracey's expression of pleasure at the effect she achieved was *shared*. It was deliberately oriented to her mother.

Tracey's mother played a game, poking the object on Tracey's stomach. Later Tracey pushed aside an offered object and then took an object with an introspective, unwilling manner, looking away. A moment later she looked quizzically at her mother, unsmiling, and then suddenly laughed. Her mother was very happy about this and Tracey, in turn, vocalized excitedly, holding her head back and making large gestures. Finally they played a game with an object which the mother animated by wagging it in her hand.

The take-and-drop game was also played with a female stranger who received eager but unsmiling interest from Tracey. When this person offered an object on her open palm and looked at Tracey, Tracey looked away flapping her hand. Then she stared at the object, head down, hands held out to the side moving. For some seconds Tracey gently resisted offers by hand, then she grasped the object when it was dangled from a thread. Later she took the object from the stranger's palm several times, each time dropping it without attempting to respond to the request that it be "given" back. Tracey was less eager to play a game with the stranger than with her mother just before. She did not join in an exchange of pleasure with the stranger as she did with her mother.

Babies show striking developments in their willingness to engage in a task with their mothers toward the end of the first year, well before speech begins, and this change turns the baby into an active pupil.

sharing a task in infancy

penelope hubley
colwyn trevarthen

Cooperation is fundamental to human life and necessary for creation of culture and technology. It involves mutual interest between actors and interlacing of intentions within a situation the actors have come to understand. Psychologists speak of children learning to cooperate by imitating adults and by following the teaching of adults. But, for interpersonal cooperation to occur, individuals must already recognize one another's intentions and actively adjust to them. Each must perceive the agency of the other in the proper context. Recent studies of infant communication behavior show that there are powerful intrinsic processes in neonates that favor recognition of human expressions and actions. When an infant is a few weeks old these abilities to know others as persons may effectively sustain complex patterns of interpersonal interaction with a familiar caretaker.

Two-month-olds listen to and watch their mothers in face-to-face orientation and enter into social engagement. They smile, make various other facial expressions, speech-like movements and hand gestures (Trevarthen, 1978a). In this communication both infant and adult become mutually involved, and the infant shows expectations of particular responses from the mother, reacting with negative emotional expression if the mother does nothing or acts irrelevantly (Murray, 1978). However, for all its complex dialogue-

We are grateful to the Social Science Research Council of the United Kingdom for assistance for this research.

like structure, this type of interaction is devoid of interest in events or objects in the external situation, or in the activities of either or both partners on objects. It has no reference different from the direct exchange of expressions of mood in the person-person dyad, and it does not involve shared purpose with respect to objects.

It is not until the end of the first year of life that infants start to engage in cooperative acts on objects, and to use forms of deliberate reference to objects or ideas within their interactions with other persons. For our purposes, *cooperation* means that each of the subjects is taking account of the other's interests and objectives in some relation to the extrapersonal context, and is acting to complement the other's response.

Some cooperative behavior, like showing and pointing, giving and taking, have been observed in the course of studies of early steps in language development (Bates, 1976; Bruner, 1977). In such studies attempts have been made to show how syntax, semantics, and pragmatics, formally distinguished in linguistic analysis of dialogue, have important precursors in pre-language communication. Recent findings in prelinguistic communication of infants with their mothers show the presence of an underlying interpersonal comprehension which may be studied in its own right, independent of language development. This interpersonal comprehension is a larger psychological function than spoken language which develops within it, greatly extending its power of reference and categorization. We are directly concerned with the structure of cooperative understanding for its own sake at an age when there is no evidence that infants can comprehend the specific reference of any word (Menyuk, 1974).

In this chapter early results are given of an intensive study, currently underway, of five girls, eight to twelve months of age, playing with their mothers. A biographical account has already been published of similar interchanges with one infant girl, who was observed from three weeks to the end of the first year (Trevathan and Hubley, 1978). It was observed that cooperative understanding became effective when that baby was about nine months of age. The second study is aimed to trace in more detail the development of cooperative activity on objects, from its early appearance.

subjects and methods

Subjects were obtained through health visitors who were asked for first born, full term infants. The health visitors considered that the infants were healthy and developing normally and that the mothers had adapted well to their infants. There was no incidence of mental illness in parents, who lived together in their own home, with no other adult family members.

The five mothers were invited to visit the department for video-recording sessions when their daughters were thirty-four, thirty-eight, forty-two, forty-six, fifty, and fifty-four weeks of age. On each occasion they were asked: (1) to play with their baby without toys; (2) to join in play with toys; (3) to refrain from initiating any interaction while silently watching as their baby played

with toys, but to be responsive with smiling or looking when directly addressed by the baby; and (4) to teach the baby a simple manipulative task—putting three wooden figures into a truck. Mother and baby were recorded at each of these activities for sessions of four minutes duration. The infant was seated in a baby chair at a triangular table, cut to fit round the infant's waist. The mother sat close to the table at the infant's left; to the right was a mirror in which was reflected the mother's face. The camera framed a full face view of the infant, a back view of the mother's head and shoulders to the right of the screen and, on the other side, her mirror reflection (as shown in Figure 3 on page 65).

Data reported in this chapter will be taken principally from situation 4, where the mother was teaching the baby to put wooden men into the truck. This was a deliberate attempt on our part to elicit instructions from the mother. She was expected to direct the baby. However, she was not told what the experimenter's intention was nor was she told how to act. She was led to believe that our interest lay in whether the infant could put the wooden figures into the truck.

Four different aspects of the behavior will be discussed. These are, the temporal patterning of communicative exchanges, the infant's integration of interpersonal acts with acts of joint praxis, the mothers' teaching behavior with the infants' responses to it, and the joint praxis acts made by the infants. The activity of mother and infant was transcribed against time and coded in the behavioral categories defined in Figure 6 on pages 74–75. We define all these behaviors to be communicative acts. They regulate communication between the partners because they are directed in relation to a manifest interest or activity of the partner, or because they respond to acts of communication. When very young infants communicate with adults they use *interpersonal acts* that make no communicative reference to objects. Object reference develops during the period under study. We defined *acts of joint praxis* to be those acts on objects that are oriented to the attention or action of the other person. Vocalizations and the direction of gaze for both mother and infant were also recorded. A section of coded transcript is given in Figure 7 on pages 76–78.

We observed sequences of joint activity and mutual attention between mother and infant separated by phases in which one or both partners were engaged in a solitary occupation. We defined communicative sequences of joint activity as starting when one person performed a communicative act which was responded to, thus creating mutual interpersonal attention or a shared focus for attending and acting. A communicative sequence ended when the joint activity and mutual attention was broken by one or both partners engaging in solitary activity or attending elsewhere. Performance alternated between the partners, one watching while the other acted on a toy and then taking over the activity while the other watched. In other words, the mother and infant repeatedly exchanged the initiative of action. In a communicative sequence one person may have made a series of communicative acts before the initiative was taken over by the partner. There were very few instances where mother and infant made communicative acts simultaneously,

though activities frequently overlapped to some degree, one starting to act before the other had completed her activity. Solitary activity included acts on the toys that appeared not to be directed to the other person's orientation or point of action. Alternatively, one made a series of performative acts which was watched by the other. Only if the latter responded was such a performance considered to be part of a communicative sequence. Merely watching without engaging the attention of the other or establishing joint activity was not taken to be communicating. The transcript in Figure 7 has been marked to show the initiation and termination of communication sequences and the exchanges of initiative.

Television recordings were transcribed and coded, then communicative sequences were marked on the transcript by an experienced observer (P.H.). The codings and delimitation of communication sequences were later checked against the recording and corrected if necessary. The categories used are so defined by objective elements of behavior that their discrimination was limited simply by the amount of attention required to see what happened in each portion of the video record projected at slow speed. The double checking verified that the behavior was correctly perceived and few changes were necessary.

Each start of a communicative sequence was categorized according to who made the first move and whether that involved (1) attracting the partner's attention to a new interest or activity; (2) taking up the object of the other's expressed interest; (3) attempting to control the other's activity on an object by taking the object or otherwise physically controlling what the other is doing to it; or (4) an interpersonal act like looking at the other's face, smiling, laughing, leaning toward the partner. The way a communication was terminated was classified according to who broke the joint activity and mutual interest, and whether this was done by starting a solitary activity or by directing the gaze away from the shared field. Also, the percentage time spent by the pair in communication, the number of communicative sequences, and the number of exchanges of initiative in each sequence were established.

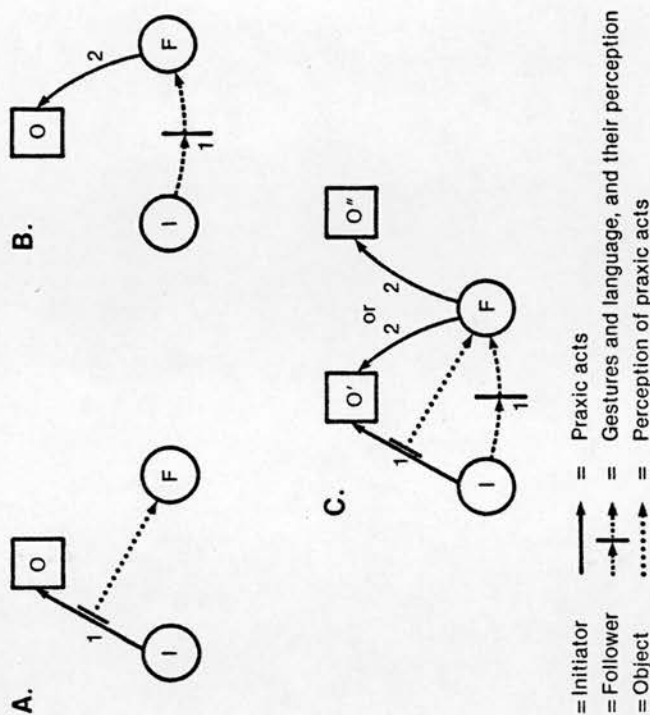
According to our prediction, as the infants became older they would more frequently start communication sequences by attracting the mother's attention to a new interest or activity of their choice. In consequence of this increased willingness of the baby to communicate, we expected more communication in each session, mainly because there would be longer uninterrupted sequences of communicative behavior.

We hypothesized that when the infants start communicating about the uses of objects, interpersonal acts would be mixed with acts of joint praxis because the infants must take account of their mothers' reactions to the situation as well as communicate their own reactions. Before the infants start to use objects for the purpose of communicating with others there is no need for them to combine interpersonal and joint praxis acts. In order to simply gain possession of an object one needs only to perceive its position and relation to surroundings. To investigate this question, analysis was made of the frequency with which infants used joint praxis acts together with looks at the mother's face, smiling or laughing, in the same communicative sequence.

In cooperative behavior between two people who are using objects, it is theoretically possible to identify two main patterns which can be combined to give a third (see Figure 1). One person can cause a response in the other by doing something to an object (Pattern A). Here the act on the object is a message for the follower. Alternatively, a person can cause an effect on an object by directing with gestures or language what his partner does to the object (Pattern B). Here there is transfer of agency, but no act by the initiator on an object. These can be combined to give Pattern C, where one person, by acting on an object and using gestures or language, can get his partner to behave in a particular way on the same or a different object. Here he is inviting his partner to share or duplicate agency.

We wanted to see if it was possible to identify these patterns in the behavior of the mothers and infants we were studying, and to establish whether the alternative roles of initiator and follower could be taken by both mother and infant. Of particular interest were the types of cooperative pat-

Figure 1. Patterns of Object Use in Communication



A—An act on an object is a message for the follower

B—The follower becomes an agent for the initiator

C—Overt invitation to share or duplicate agency

The sequence of communication is shown by numerals. Feedback to self (reaffirmance) and interpersonal acts of mutual gaze and smiling which are combined with communicative acts are omitted.

terns the mothers used in teaching the infants to put the figures into the truck, and how the infants responded to these. We predicted that the frequency of the mothers' teaching acts would change in relation to the infants' responses. The successful strategies would increase as the less successful were abandoned. All the infants were expected to comply with instructions and imitate acts on objects more frequently when older. Information about the contribution of the infants to changes in content of the interactions was obtained by calculating the frequencies at different ages of the different acts of joint praxis defined in Figure 6.

results

The frequencies and percentages of how and by whom the communicative sequences were initiated and terminated and details of the temporal patterning of communicative sequences are given in Table 1. Mothers initiated between 70 and 85 percent of the communicative sequences at all ages. At all sessions, the most frequent method mothers used to initiate interactions was by attracting their infants to their own interest. For babies, at all ages, the most frequent way of starting communication was by looking at the mother's face. None of the infants initiated communication by an attempt to control what the mother did; they did not take objects from her or try to regulate what she was doing.

In the earlier sessions the babies never started an interaction by attracting their mothers to their own interest, though from forty-six weeks on, a new topic chosen by the baby made up one third of all the interactions started by them. This increase was not significant. Thus at first infants used direct social interest to initiate social interaction. Later they started some communicative sequences by introducing an object. At all ages interaction was terminated, almost exclusively, by the infants becoming absorbed in solitary activity or looking around the room. Of course, in our experimental procedure the mothers were trying to maintain interactions but they did not always have a willing partner.

Over all, the time spent in communication was stable for individual mother-infant pairs at different ages. The subjects showed a drop at fifty-four weeks in the number of communicative sequences per four minute session (Table 1, Column 3, Sign Test comparing fifty and fifty-four weeks, $p > .05$). * This reflects a significant lengthening of communicative sequences from an average of 3.6 exchanges at fifty weeks to an average of 6.3 exchanges at fifty-

* All statistics given in this chapter were calculated using either Page's L-Test or the Sign Test. Page (1963) has developed a test which assumes dependence between groups of subjects, and independence between individuals. It is a ranking method of trend analysis for three or more points and requires that the direction of trend be predicted. When we used Page's L-Test, the results from sessions 1 and 2, 3 and 4, and 5 and 6 were combined in pairs to make three groups. The Sign Test can be used for a hypothesized difference in behavior between related groups. The groupings of data for this test will be given in the text.

Table 1. Temporal Patterning and Initiation and Termination of Communication Sequences

Communication Sequences	Terminated by	Percent Communication Sequences					Initiated by Infant					Initiated by Mother				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sessions		34.4	37.8	41.6	45.8	50.0	54.2	6	1	1	1	4	24	22	45	31
Mean Age of Infants in Weeks		15.6	14.4	15.2	12.8	15.2	10.2	0	3	3	12	0	0	6	1	6
Average Number Communications in 4 Minute Sequences ^a		3.7	3.3	3.4	3.6	3.6	6.3	0	1	1	12	0	0	6	1	6
Average Number Exchanges per Communication in 4 Minute Sequences ^b		43.1	42.9	43.9	40.6	47.9	58.2	0	3	3	12	0	0	6	1	6
Total Duration of Communications as % Session		46	57	65	37	45	31	0	3	3	12	0	0	6	1	6
Attracts Infant to Own Interest	Initiated by Mother	22	13	14	19	27	22	16	13	13	6	1	11	24	11	24
Takes up Infant's Interest		1	6	11	0	1	4	0	0	0	0	0	0	0	0	0
Controls Infant's Activity		0	0	0	8	8	6	0	0	0	0	0	0	0	0	0
Interpersonal Act		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Attracts Mother to Own Interest	Initiated by Infant	3	1	0	8	3	0	0	0	0	0	0	0	0	0	0
Takes up Mother's Interest		12	10	11	16	12	12	0	0	0	0	0	0	0	0	0
Interpersonal Act		0	2	1	2	1	0	0	0	0	0	0	0	0	0	0
Mother in Solitary Activity		61	80	67	76	76	68	0	0	0	0	0	0	0	0	0
Infant in Solitary Activity		39	18	32	23	23	32	0	0	0	0	0	0	0	0	0
Infant Looks Away		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

^aSession 5 vs. 6, $p < .05$.
^bSession 5 vs. 6, $p < .05$.

four weeks (Table 1, Column 4, Sign Test comparing fifty and fifty-four weeks, $p < .05$). There was no appreciable change in this before fifty weeks. Analysis showed that older infants used joint praxic and interpersonal acts together in the same interaction sequences more often than was the case at younger ages ($L = 66$, $p = .05$; Figure 2). At thirty-four weeks only 12 percent of all communicative sequences include both kinds of acts, but at fifty-four weeks the picture has changed significantly. Of all the interaction sequences, now 31 percent include both interpersonal and joint praxic acts by the babies. It appears that at the younger ages the infants are keeping the two kinds of purpose separate, but this decreases with age.

When we traced the cooperative patterns described in Figure 1, we found all three of them, with both mother and infant playing the roles of initiator while the other followed (Figure 3). The mother doing something to a toy to influence the behavior of her infant was common throughout the period of the study. In contrast, none of our infant subjects used a toy to influence the behavior of their mothers till late in the first year. When the infants were almost one year old, Pattern B emerged, with the mothers gesturing and speaking to direct the praxic actions of their babies slightly earlier than the reverse pattern where the infant influenced what the mother did, by gesturing. The developmental emergence of Pattern C was similar to that of Pattern B. It appeared when the infants were nearly one year old and again the mother was initiator earlier than the baby.

Responding to instructions that they were to teach their daughters how to put the figures into the truck, the mothers adopted three mutually exclusive strategies of teaching, which we called "demonstrates," "indicates a locus," and "indicates a further object." We call these last two "instructions." When the mothers *demonstrated* putting a wooden figure into the truck, they did something to attract attention to what they were doing with the aim of getting the baby to imitate this act—they tapped a wooden figure on the table or the truck or held it out to the baby, and made statements like, "Into here,"

Figure 2. The Composition of Interactions: Changes with Age

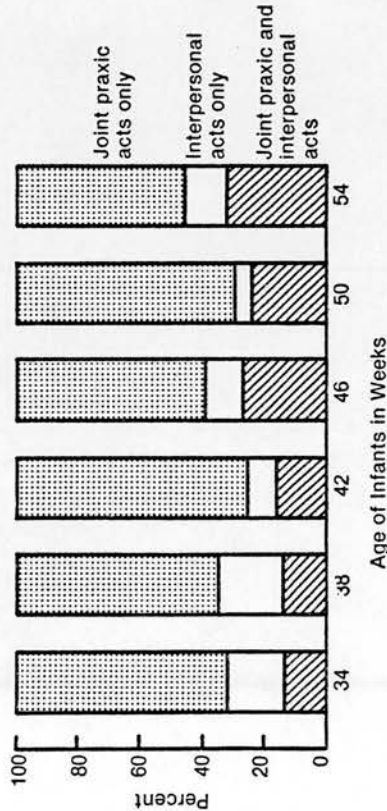
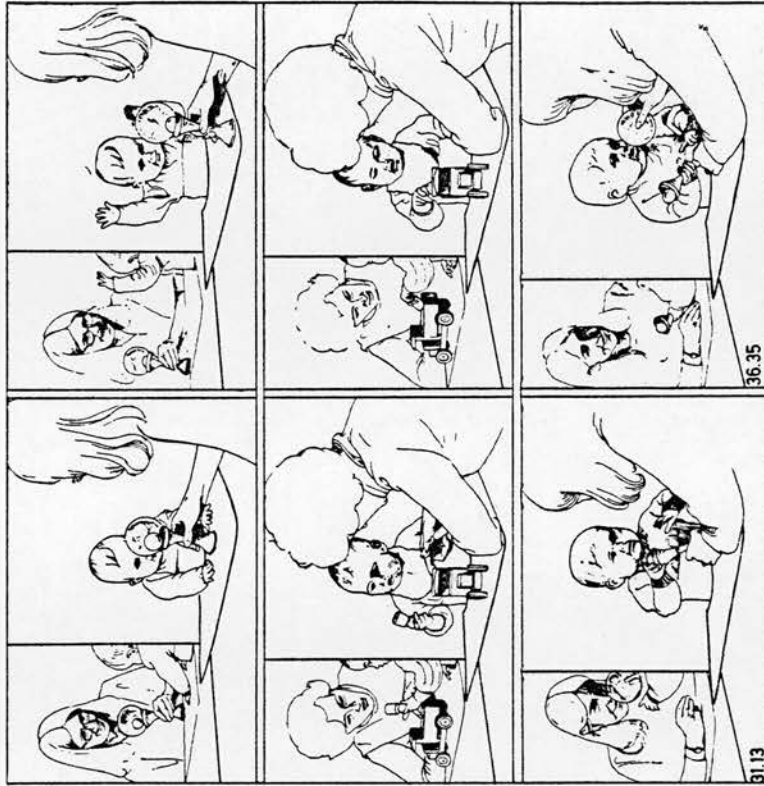


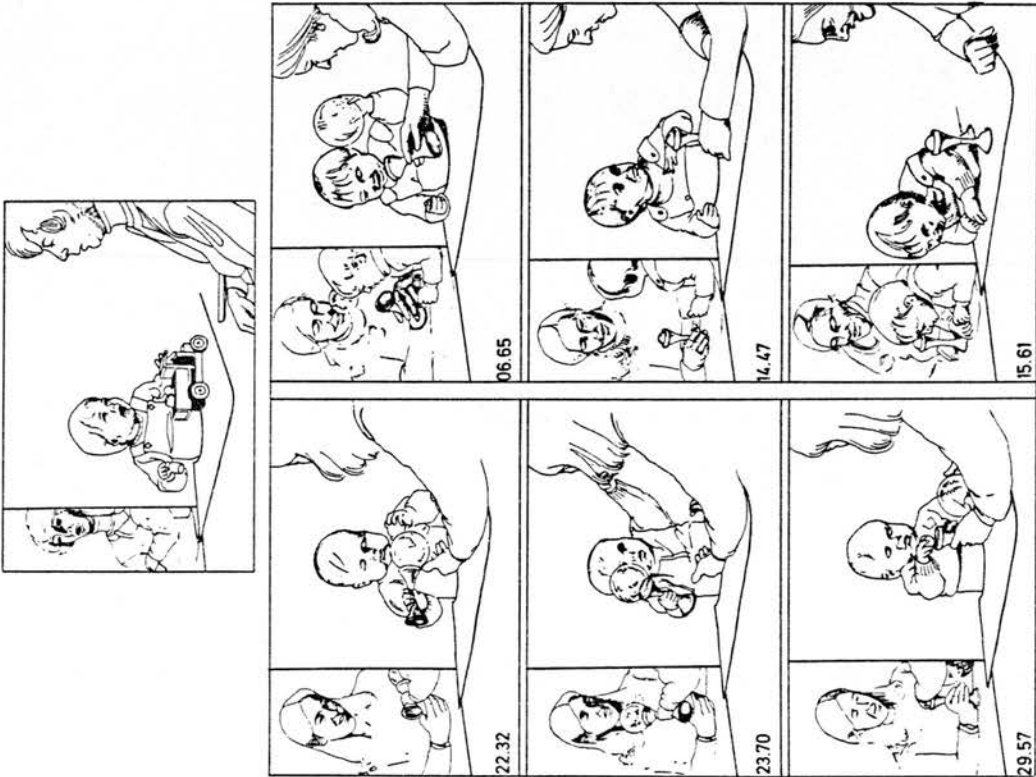
Figure 3. Communication Using Objects: a. The Mother as Initiator



Top: Pattern A: Mother shakes the rattle, infant excitedly hits table, smiling. (Vanessa S. 34 weeks)
 Middle: Pattern B: The mother, pointing, instructs the baby to put a figure into the truck. The infant complies. (Allison W. 50 weeks)
 Bottom: Pattern C: The mother holds a plastic globe to her mouth and hoots into it while the baby watches. She then holds the globe to the infant's mouth. The infant vocalizes into it, imitating the pitch used by the mother. (Vanessa S. 54 weeks)

"Put it back in again," "I'll put this one in," or they counted aloud as they put the figures in one by one. Here the mothers were attempting to initiate cooperation of Pattern C. With gestures like pointing, or tapping into the truck, the mother indicated a locus for the infant to put a wooden figure she was already holding. Mothers frequently accompanied their gestures with statements expressing their intention: "Will you put the man in there?", "Put them back in now," and "In with the red one." When the mothers indicated a further object, they offered, touched, tapped or pointed to it immediately after the baby had put one man into the truck, to get the baby to repeat the act of putting in. Mothers often accompanied such acts by questions, like "What about this one?", "Can he get in too?", and, "Are you going to put this little

Figure 3. Communication Using Objects: b. The Infant as Initiator



Top: Pattern A: The infant taps a toy on the table while looking and smiling at the mother who laughs and comments facetiously. (Alison H. 54 weeks)
Left, Top to Bottom: Pattern B: The infant tries to put the ball into the rattle but cannot. She then holds the rattle and ball to the mother and looks at her. The mother separates the rattle and the infant puts the ball into the handle. (Vanessa S. 54 weeks)
Right, Top to Bottom: Pattern C: The infant throws the globe onto the floor, then looks at the mother. She looks again to the floor, leaning far over and smiling. The mother smiles and gets up to retrieve the globe. (Laragh B. 54 weeks)

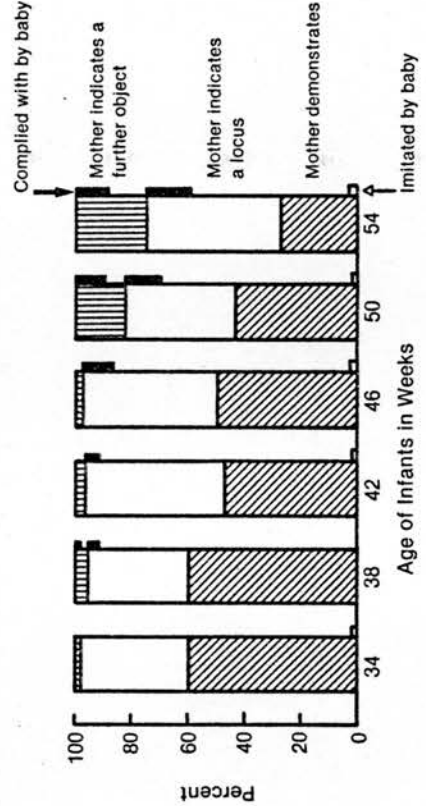
man in?" In instructing the infant, the mothers attempted to initiate cooperation of Pattern B.

When a further object was indicated, the mother was building on the baby's preceding activity. The baby had performed some act, and the mother then tried to get the baby to repeat it on a different object chosen by the mother. In indicating a locus the mother was attempting to extend in a particular way the infant's use of an object already being handled. For the former kind of cooperation infants had developed a plan for handling the toys. They may accept or ignore the mother's suggestion to repeat this activity. In the second case, the mother sought to aim the babies' activity in the manner she, the mother, wanted.

Results on the mothers' teaching behavior and the infants' responses are given in Figure 4. Throughout the period studied, the more common of the two kinds of instruction was the locative one, and this did not change in frequency with age of infant. This kind of instruction was also the more frequently complied with. Indication of a further object was infrequent until the last two sessions (fifty and fifty-four weeks) when it made up one third of all instructions (Sign Test, comparing first three and last three sessions, $p = .05$). During the period studied, the percentage of mothers' instructions that were complied with by the infant increased from 16 percent at thirty-eight weeks to 40 percent at fifty and fifty-four weeks. The frequency of demonstrations showed a statistically significant decrease during the period ($L = 66$; $p = .05$).

The infants imitated demonstrations of putting in only seven times, and these were more frequent during the later sessions. It is notable that as the babies complied with more instructions, the number of demonstrations given by the mothers decreased. Cooperation of Pattern B was the most common and effective form used by the mother trying to get the baby to perform a particular act. In comparison, Pattern C was very infrequent and attempts

Figure 4. Mothers' Demonstrations and Instructions and Infants' Responses



to initiate C were largely ineffective. There were several instances of praxic imitation by the infants which included other acts as well as imitation of putting in. The first three sessions yielded only two imitations while the last three sessions yielded twelve, but this increase is not statistically significant.

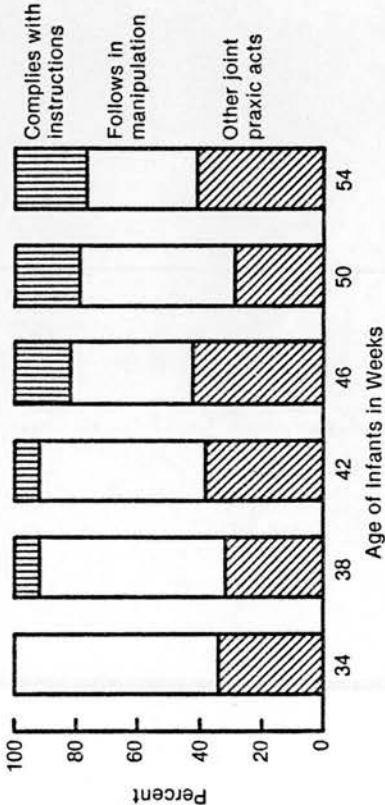
The frequency with which the mothers indicated a locus when the infants first complied with their instructions was compared with the frequencies in the immediately preceding session in which the infants did not comply. Four mothers indicated a locus more often when their infants began complying. One mother did so less, but all her acts of communication about the task were reduced in the session when the infant began complying. These results are not significant but the trend indicated would merit further investigation.

The data on the infants' acts of joint praxis showed a change with age in the sensitivity of the infants to the mothers' actions (Figure 5). The eight-month-old infants tended to pick up and handle the objects on which the mothers were or had just been acting. How they manipulated the toys which the mothers were acting on or had just released seemed to have no relation to the mother's specific purposes or expressions of interest. There was no imitation of what the mother did, and no attempt to comply with her instructions. By the age of twelve months, the babies appeared less likely to handle the object the mothers were or had just been handling, but this decrease was not statistically significant. All the infants had by the end of the first year begun to comply with the mother's instructions and to imitate the particular way she used the objects. Their compliance became more frequent and reliable with time (Page's $L = 70$; $p = .001$). None did so at thirty-four weeks, three did at thirty-eight weeks, and the other two started at forty-two weeks and forty-six weeks respectively.

conclusions

Throughout the five month period studied the mothers and infants showed similar temporal patterning of communicative sequences. They did

Figure 5. Types of Cooperative Act by Infant



not spend more time communicating as the infants became older, in spite of the fact that individual communicative sequences were significantly longer in the last session. But while on the whole the temporal patterning did not change, there were important changes in the content of the communications. The balance of initiative in starting communication sequences lay largely with the mother throughout, though the infants did initiate some interactions. The infants' increasing ability to attract the mother to their own interest as a way of initiating communication seemed to reflect their greater ability to integrate expressions of interpersonal communication with cooperative praxic acts. These results indicate that with increasing age there was a greater proficiency in combining attention to a task and attention to a person. Some concept of the cooperative understanding of the task was developing.

Gazing at a person's face is recognized as a social response in very young infants as well as in adults. In a study of three to four month-olds Stern (1974) found that the infants used gazes to and away from the mother's face to regulate the degree of social contact. Argyle and Dean (1968) suggest that for adults the main functions of mutual gaze are monitoring the partner for feedback and regulating the interaction by signalling readiness to converse. Spitz and others (1970) in their study of smiling found that this remarkably precocious form of expression became specifically social in the period from eight to twelve weeks. In studies of interactions between infants and adults, authors have included smiling as a category of infant social behavior (Brazelton and others, 1974; Stern, 1977). Smiling has also been observed to accompany achievement of cognitive mastery by infants (Papousek, 1967; Piaget, 1953; Watson, 1972). As Haviland (1976) points out in discussing the assessment of infant intelligence, psychologists make inferences about infants' understanding and knowledge using evidence of the affect and interpersonal relationships of their subjects as well as the infants' sensorimotor behavior with respect to the environment. Affective expression can have no possible effect on the physical world, nor can it contribute directly to acts of exploration or performance. It can only influence the understanding of another person.

Further work is underway to investigate in detail in what circumstances the infants smile, laugh and look at the mother's face while the two play a game or perform a task together. It is hoped this will give a clearer understanding of the regulatory, monitoring and expressive functions of these behaviors in cooperative use of objects, a topic which has been remarkably neglected until recently.

We have found changes in communication to be strongly reflected in the mothers' teaching acts and the infants' responses to them. The mothers did not teach their daughters to put the figures into the truck by causing them to imitate demonstrations, even though the babies did occasionally imitate. Immediate imitation of acts on objects was far more common in the second half of the period studied, which seems to indicate that this kind of imitating was appearing for the first time towards the end of the first year. This concurs with Piaget's (1962) observations. His earliest example of imitating an act on an object occurred when his daughter Lucienne was eleven months twenty-six

days. All the other instances of imitation which he reported as occurring prior to this age were movements of the child's own body. They did not involve manipulation of objects. Piaget gives several examples of imitations of acts on objects after his children were twelve months of age. These include writing, hitting a cork over with a stick, hitting oneself with a box or doll. It would appear that there is an important change in imitation at the end of the first year and that the cause of this change lies in the kind of action by the mother which the infant can now perceive as model. Whereas the younger baby can only imitate by moving his own body to reproduce a gesture, vocalization or facial expression, at one year he can conceive another's act on an object as something he can also do, and so he performs a matching act of praxis.

Our evidence suggests that before the first birthday, the mother's demonstrations may not be effective in teaching an infant to put wooden figures into the truck because the younger infant could or would not imitate acts on objects. It seems reasonable that mothers should decrease the amount of demonstrations they used as they found their instructions were increasingly obeyed. The mothers did demonstrate less when their infants were older, so favoring the then more effective teaching behaviors of instruction. In the early stage, demonstrations may be useful to repeatedly emphasize a particular relationship between the objects, and this may help to focus the infant's attention to that relationship even though the infant then fails to imitate. We found that demonstrations of "putting in" lead the infant to handle the figure in the truck or take them out, but not to put them in.

Why, exactly, were instructions effective in getting all the babies to put objects into the truck whereas demonstrations were relatively ineffective? A possible factor is the different degrees of completeness of action in demonstration and an instruction. The former may be taken to be a finished act, changing the arrangement of objects. The latter highlights an aspect of the situation which the mother can assume the infant understands both with respect to the kinds of acts that can be done with the objects and to the possible ways of relating the objects together. An instruction does not change the arrangement of objects, but shows to the baby the mother's interest in a particular aspect and possibility for action and that she is deliberately leaving the action uncompleted. The infant can then carry through the mother's expressed purpose. In a demonstration the mother's aim is fulfilled by her own activity, and so the infant sharing the mother's interest may have no motivation to act the same way.

While it is not possible to state conclusively whether it was mother or infant who was the more responsible for generating and directing this change in interaction, all of the mothers reduced demonstrations during the period of study and four of them increased their instructions in the session when the baby first complied. They may have been adapting to their infants' new kind of responsiveness. In his study of mothers' teaching strategies with six month olds, Kaye (1977) found mothers using shaping (simplifying the task and then making it progressively more difficult), hand tugging (physically moving the infant's arm and hand to perform the task), and demonstration. None of his

mothers was reported to use instruction. It may be that the infants, like our subjects at eight months, were not yet responding to instructions; and so the mothers were not using them.

The analysis of the infants' acts of praxis cooperation revealed a similar change in the content or strategy of communication. At eight months the infants were simply attracted to the mothers' activity and drawn to take up the object she was or had been handling immediately before. In this way a common focus of action was established. However, at this age the infants showed no evidence that they could perceive a distinction between the different acts employed by the mothers. By one year these same infants were making differential responses to particular acts by the mothers. They were less likely simply to handle the toy the mother was acting on. It appears that during the period of study the babies moved from joint action on a common topic to reciprocal or complementary involvement in a shared and specific task.

A shared task requires first that a common focus for action be established. We may speculate about the significance of the apparent ease with which a common focus for action is formed at an age when the infants would take no active part in the task chosen by the mother. Attending to and acting on the topic of another's action could lead to several possible developments towards full praxis cooperation in a joint task. First, it might allow games where the mother teases the infant who is striving to get hold of a toy, making a game of the interlacing of purposes. This, the playing of games, is indeed the earliest form of evidence obtained by us that the infant is becoming actively involved in perceiving objects within an interpersonal framework (Trevathan and Hubley, 1978). Secondly, sharing of goals for action may draw the infant's attention to the mother's acts and their outcomes when the infant's motives are at first to act on the objects for himself, and this may help enlarge the infant's awareness of what objects afford for praxis agency. Thirdly, having a common cause automatically permits shared experience in which cooperation with communication about praxis may emerge.

To recapitulate, our results show that between thirty-four and fifty-four weeks infant subjects began to engage with their mothers in communication about using objects. While the temporal patterning and taking of initiative in starting and terminating communicative sequences had changed only slightly by the end of the period of study, the way the mothers and infants behaved while communicating was transformed. As the infants grew older they began to integrate interpersonal acts and acts of joint praxis together, they complied with the mother's instructions, and they imitated her acts on objects. Simultaneously they decreased the frequency with which they acted on an object the mother had just handled in a manner irrelevant to her activity. The mothers reduced the number of demonstrations they made and most increased the frequency of instructing when the infants started to comply. Mothers and infants together started communicating, using objects in a way that transmitted messages and invoking people as agents to help in a task.

We would explain the findings as follows. At the beginning of the study the infants did not understand or have clear expectations of the

mothers' behavior with objects, hence the mother was not able to communicate about objects to them. The necessary understanding appeared during the period of the study. We believe that the meaning of the mothers' activity changed because the babies started somewhere in the twenty weeks over which the study extended to conceive their mothers as praxic agents doing particular things. In early sessions the mothers' activity was clearly attractive to the infants, who watched and often handled the same objects as the mothers were using. However the details of what the mothers wanted to do had no effect.

Piaget (1953) states that infants in stage 3 of the sensorimotor period show intelligence in attempting to repeat accidentally produced interesting events, but that they do not set out to create them. The stage 4 infant, at about eight or nine months, can use acts and combinations of them to achieve some predetermined aim, and so shows some understanding of his own agency. In his work on causality, Piaget (1954) suggests that the stage 3 infant cannot distinguish between persons and the physical world, and acts as though he were the only agent producing effects in his world. However, at stage 4, infants can "set in motion an intermediary capable of producing a (desired) result" (p. 203) and moreover he "attributes to someone else's body an aggregate of personal powers" (p. 261). Piaget suggests that the activity of another person makes the greatest contribution to objectifying causality in the external world and he found that at stage 4 the infant is no longer acting on someone else's body as inert matter in order to achieve his own result or, more importantly, repeat an effect presented to him. Rather he is using gentle pressure or touch to evoke a repetition of something he desires. In other words, the stage 4 infant is starting to show understanding of other people as agents who handle objects with predictable outcomes, and beginning to distinguish his own agency from that of other people.

While Piaget has noted an important change in the infant's understanding of self and of others in the transition from stage 3 to stage 4, his explanation for this is entirely in terms of solitary cognition. It overlooks the fact that the change has its effects and expresses itself in interpersonal communication. The two users of objects can, when the baby is in stage 4, communicate about their actions by relating the already established interpersonal understanding to a context of reality which they share. Perceiving someone as an agent implies seeing that person as having plans and goals in action; it implies a degree of subjectivity. Cooperating with someone in joint action on objects involves taking up at least some part of the other person's plans and goals. In cooperative actions on objects the partners combine communicative intention and praxic agency having effect both on each other and on the physical world. None of these aspects are explicit in Piaget's account.

Habermas (1970) proposes that what he calls intersubjectivity makes mutuality of understanding possible and that "dialogue constituent universals" of language behavior simultaneously generate and describe the intersubjectivity in the minds of language users. While his analysis is in linguistic terms, the concept of intersubjectivity may apply to other systems of communication that are independent of speech. The first group of dialogue con-

stitutive universals which Habermas suggests can be used to analyze speech are the personal pronouns which enable an "interlacing of perspectives" between people and by which they keep separate their own and other people's viewpoints and so understand the meaning for both of them of events in surroundings. This kind of interlacing of subjective perspectives exists also in interactions of young infants with other persons. Infants of two months expect particular responses from a mother and make subtle changes of their behavior in response to what she does. Trevarthen (1978a) terms the function brought into evidence then *primary intersubjectivity*.

The second set of Habermas' dialogue constitutive universals are deictic expressions that specify time and space, the articles and demonstrative pronouns. He says that these "link the levels of intersubjectivity on which the subjects converse and interact reciprocally with the levels of objects about which the subjects converse" (pp. 141-142). This function appears in protolanguage at the end of the first year (Halliday, 1975) and is what we have termed *secondary intersubjectivity*, combining communication about action on objects with direct dyadic interaction (Trevarthen and Hubley, 1978).

The third and fourth classes of dialogue constitutive universals are performative speech acts. Speech act theory (Austin, 1962) has drawn attention to the interpersonal functions or intentions (illocutions) expressed in spoken language (locutions) which are not necessarily expressed directly in the propositional content. Dore (1975) applied speech act theory to holophrases in early language development. Bruner (1975) and Bates (1976) both looked at pre-language communications which are precursors of speech acts. Such studies, illuminating the nature of communication, are beginning to describe a development of the intersubjective abilities of infants.

We do not yet understand the role of communication with other people in the development of cognitive abilities, though we are aware of familial and environmental influences which have implications for the cognitive development of children (see Hess and Shipman, 1965). Recently, Piaget's methods, conceived by him to be examining purely intellectual abilities of children, have come under scrutiny. Donaldson (1977), as a result of work with her colleagues investigating the communication between experimenter and child, has been led to conclude "we must no longer ignore the social or interpersonal aspects of the situation in which we endeavor to study children's concepts. If, as it now seems, the child's main purpose when we test him is to discover what *we* mean rather than what our words mean (in our formal sense) then we shall grossly distort our view of his cognitive skills if we fail to recognize what he is doing" (p. 289).

This shift of emphasis into studying the interpersonal meaning of the exchange for the child is also seen in Halliday's (1975) study of language development from a functional viewpoint. He contends that infants learn to mean in interactions with others long before they use language, and that in learning language the child is also learning the culture. Halliday suggests that for the child "the semantic system which he is constructing becomes the primary mode of transmission of culture" (p. 66).

The changes in communication using objects which we are investigating show the child's early attempts to regulate another person's purposes in handling objects. They reveal early compliance with another person's attempts to regulate how the infant uses objects. We suggest that these new abilities open him to early understanding of the technology and other products of human culture (Trevathan, 1978b). Barnett (1973) posits a new name for our species, *Homo docens*, drawing attention to man as a teacher. He suggests that teaching is distinctively human and necessary for survival, as culture (clothing, building, food preparation, courting, and so on) is transmitted by one generation teaching another. He distinguishes teaching from imitation, apparent in many other species, his definition of teaching requiring that there be feedback from the pupil and that it occur in an interactive relationship. This requires man to be not only a teacher but also a pupil, and our work leads us to suggest that at the end of the first year our subjects had become pupils by some positive genesis of an adaptive function essential to being human. They could then gain understanding not only through their own activity, but also from another person by imitating, and even more powerful by the more complex tactics of cooperation that provoke assistance and instruction.

Figure 6. Categories for Coding the Communication of Mothers and Infants in the Teaching Task (Situation 4)

- I. Acts of Joint Praxis
 - A. By Either Mother or Baby
 1. Points—identifies a focus of interest with extended index finger and extended arm.
 2. Shows—holds out an object toward the other, but does not encourage or permit the other to take.
 3. Gives—puts object into the other's hand or mouth. This may follow "Asks" by the mother; alternatively, baby or mother may put a toy into the other's hand without invitation.
 4. Offers—holds out an object to the other and does not resist when the other takes, or persists to encourage taking.
 5. Takes Object—removes objects from other's hand. This may or may not follow "Offers."
 6. Follows in Manipulation—grasps or touches an object which the other is handling or has been handling immediately before.
 7. Praxic Imitation—immediately following the other, performs a similar act on the object.
 8. Regulates the Object—acts on the toy which the other is handling, trying to assume control of it. Always in opposition to the purposes of the other.
 9. Resists—withdraws hand, hits out or makes other efforts against the other's attempt to "Impose," "Regulate," or "Take."
 10. Touching with Object—touches part of the other's body with a toy.
 - B. By Baby Only
 11. Reaches—the baby leans and reaches toward an object out of reach with one or both hands. (This is always understood by the mothers to indicate an interest on the part of the baby. The baby may simply be attempting to grasp the object for herself.)
 12. Acquires—the baby does not resist the mother's attempt to impose an act, and contributes to that act.
 13. Accepts Assistance—the baby completes an act which the mother is assisting. The infant's activity is interrupted while the mother rearranges objects.
 14. Complies—the baby acts according to the mother's instructions.

C. By Mother Only

15. Shows Interest—mother leans forward, looking at what the baby is doing to a toy.
16. Manipulates to Follow Interest—mother handles the object which the baby is looking at but not touching.
17. Assists—by moving objects, the mother helps the baby to continue or complete an act.
18. Asks—mother holds out her hand for an object to be placed in it, before the baby offers the object.
19. Indicates a Locus—by pointing or touching the mother attempts to get the baby to place an object in a particular place.
20. Moves Toy Nearer—mother moves a toy nearer to the baby. (The mothers used this to attract the infant's attention or to bring a toy within the infant's reach.)
21. Indicates an Object—mother taps, holds out, points to, touches, or grasps and releases an object which the baby is not looking at, in an attempt to direct the baby's attention to it.
22. Indicates a Further Object—as for indicating an object, but here the mother attempts to cause the baby to repeat an act.
23. Demonstration—mother having attracted the baby's attention, acts to show a transformation of objects.
24. Imposes an Act—mother moves the baby's arm to make an act on an object.

II. Interpersonal Acts

1. Smiles—this is recognized intuitively. No attempt is made here to define the facial movements.
2. Laughs—as for smiles. Laughter includes vocalization absent from smiling.
3. Looks at the Other's Face—baby looks at the mother's face. Mother returns a look by the baby. (Note: mothers continually shift their gaze between the infant's face and what they are doing. For the purposes of analyzing the interaction, only those instances where the mother is returning the baby's gaze are included.)
4. Leaning Toward the Baby—the mother leans toward the baby, looking at the baby's face. A deliberate attempt to take over the baby's attention.
5. Reaches Toward the Mother—the baby leans toward the mother, with her arms reaching out.
6. Touching the Partner—touching the other's hand or face. The part of body touched is noted.
7. Vocal Imitation—immediately following the other, makes a similar vocalization.

Figure 7. Sample Coded Transcript of Fifty Seconds of a Session (Alison W. at Fifty Weeks with her Mother)

Mother's Behavior				Time		Infant's Behavior			
Coding	Speech	Manipulations and Gestures	Gaze	M i n	S e c	Gaze	Manipulations and Gestures	Vocn	Coding
1.1 Offers Indicates a locus	That's right			56	00	G + Y in M's hand			
	Put that one in	Offers G	B's face Man O + B			Man O + M	Takes G Puts G into T		Takes
		Points into T	Man B	56	05	Man O			
	Oh you're going to take it out again		B's face Man B B's face	56	10		Takes G out of T Takes R out of T Drops G		
2.1 Indicates a locus	Put it in	Taps in T	Man B Man O Man B			Man M T Man O T	Handles G + R on table Puts R into T		Complies
	That's a good girl			56	15				
2.3 Indicates a further object	Put the other one in	Grasps G	Man O			Man M			
	Put that one in	Offers G	B's face Man B Man O + B			Man O + M Man O	Takes G Puts G into T Hits G in T		Takes Complies
	That's a clever girl			56	20				
2.5 Indicates a further object	You don't have to kill them when you put them in	Offers Y	B's face			Man M Man O + M	Takes G		Takes
	You can just put them in gently					Room Man O	Holds G		
3.1 Indicates a locus	Put that one in	Points into T	Man O B's face Man B B's face Man B				Puts G into T Settles G in T		Complies
	That's lovely			56	30	TGY + R			

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